Major Stormwater Management Plan
(Major SWMP)
For
LILAC HILLS RANCH-MASTER TM
TM – 5571 RPL-3
Valley Center, San Diego County, California

Preparation/Revision Date: 5-3-13

Prepared for:

Accretive Investments, Inc.
12275 El Camino Real, Suite 110
San Diego, Ca 92130

Prepared by:

Landmark Consulting
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San Diego, Ca 92121
858-587-8070

The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan have been prepared under the direction of the following Registered Civil Engineer and meet the requirements of Regional Water Quality Control Board Order R9-2007-0001 and subsequent amendments.

David Yeh, RCE 62717, Exp 6-30- 14 ______________________ 5-3-13 ____________

Date

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Stormwater Intake Form for Development Projects.

Project Name:	Lilac Hills Ranch,
Project Location:	S'ly of W. Lilac Road, E'ly of I-15
Permit Number (Land Development Projects):	TM 5571 RPL-3
Work Authorization Number (**CIP only**):	
Applicant:	Accretive Investments, Inc.
Applicant's Address:	12275 El Camino Real, Suite 110 San Diego, Ca 92130
Plan Prepared By (*Leave blank if same as applicant*):	Landmark Consulting
Preparer's Address:	9555 Genesee Ave. Ste. 200 San Diego, Ca 92121
Date:	5-3-13

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9926) requires all applications for a permit or approval associated with a Land Disturbance Activity to be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date
	YES	NO	
Revision			
Revision			
Revision			

Instructions for a Major SWMP can be downloaded at
http://www.sdcounty.ca.gov/dpw/watersheds/susmp/susmp.html

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.

STEP 1

PRIORITY DEVELOPMENT PROJECT DETERMINATION

TABLE 1: IS THE PROJECT IN ANY OF THESE CATEGORIES?

Yes ❑	No ☒	A	Housing subdivisions of 10 or more dwelling units. Examples: single-family homes, multi-family homes, condominiums, and apartments.
Yes ❑	No ☒	B	Commercial—greater than one acre. Any development other than heavy industry or residential. Examples: hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; airfields; and other light industrial facilities.
Yes ❑	No ☒	C	Heavy industry—greater than one acre. Examples: manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas (bus, truck, etc.).
Yes ❑	No ☒	D	Automotive repair shops. A facility categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.
Yes ❑	No ☒	E	Restaurants. Any facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet. Restaurants where land development is less than 5,000 square feet shall meet all SUSMP requirements except for structural treatment BMP and numeric sizing criteria requirements and hydromodification requirements.
Yes ❑	No ☒	F	Hillside development greater than 5,000 square feet. Any development that creates 5,000 square feet of impervious surface and is located in an area with known erosive soil conditions, where the development will grade on any natural slope that is twenty-five percent or greater.
Yes ❑	No ☒	G	Environmentally Sensitive Areas (ESAs). All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. “Directly adjacent” means situated within 200 feet of the ESA. “Discharging directly to” means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.
Yes ❑	No ☒	H	Parking lots 5,000 square feet or more or with 15 or more parking spaces and potentially exposed to urban runoff.
Yes ☒	No ❑	I	Street, roads, highways, and freeways. Any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
Yes ❑	No ☒	J	Retail Gasoline Outlets (RGOs) that are: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

To use the table, review each definition A through K. If any of the definitions match, the project is a Priority Development Project. Note some thresholds are defined by square footage of impervious area created; others by the total area of the development. Please see special requirements for previously developed sites and project exemptions on page 6 of the County SUSMP.

STEP 2

PROJECT STORMWATER QUALITY DETERMINATION

Total Project Site Area **608.0 Acres**

Estimated amount of disturbed acreage: **440 Acres**
(If >1 acre, you must also provide a WDID number from the SWRCB)

WDID: **Deferred to during final engineering**

Complete A through C and the calculations below to determine the amount of impervious surface on your project before and after construction.

A. Total size of project site: **608.0 Acres**

B. Total impervious area (including roof tops) before construction **71 Acres**

C. Total impervious area (including roof tops) after construction **72 Acres**

Calculate percent impervious before construction: B/A = **11.7 %**
Calculate percent impervious after construction: C/A = **11.8 %**

Please provide detailed descriptions regarding the following questions:

TABLE 2: PROJECT SPECIFIC STORMWATER ANALYSIS

<table>
<tr><td>1.</td><td>Please provide a brief description of the project.</td></tr>
<tr><td colspan="2">The project is a master-planned community on approximately 608.0 acre rural land with existing estate type single-family homes, agriculture, some paved roads and some undisturbed natural areas, in the community of Valley Center and Bonsall, County of San Diego.</td></tr>
<tr><td>2.</td><td>Describe the current and proposed zoning and land use designation.</td></tr>
<tr><td colspan="2">The proposed development consists of the creating of 6 vacant lots and access roads for the eventual creation of a 1746 dwelling unit master planned community. The existing zoning is A70 and the proposed zoning consists of RU2, RU4, RU 7, RU 10, R10 and C34.</td></tr>
<tr><td>3.</td><td>Describe the pre-project and post-project topography of the project. (Show on Plan)</td></tr>
<tr><td colspan="2">The project is located on the east side of Interstate 15, southerly of W. Lilac Road in the County of San Diego, State of California.

Under the pre-project conditions, the overall project site is on a general north to south sloping terrain over rolling hills and valleys. There are a few existing rural estate type homes surrounded by crop land and agricultural buildings and green houses with access roads amongst natural trees and shrubs.

The grading of the proposed development will follow the general land form with mass graded building pads.

All storm water management for all offsite improvements will be addressed in later phases' implementing tentative maps.</td></tr>
<tr><td>4.</td><td>Describe the soil classification, permeability, erodibility, and depth to groundwater for LID and Treatment BMP consideration. (Show on Plan) If infiltration BMPs are proposed, a Geotechnical Engineer must certify infiltration BMPs in Attachment E.</td></tr>
<tr><td colspan="2">The site soil is classified as Type "C" as defined in the San Diego County Hydrology Manual and is characterized as having very slow infiltration rate when thoroughly wetted, Chiefly clays that have a high shrink-swell potential, soils that have a high permanent water table, soils that have a claypan or clay layer at or near the surface, or soils that are shallow over nearly imperious material. Rate of water transmission is very slow.</td></tr>
<tr><td>5.</td><td>Describe if contaminated or hazardous soils are within the project area. (Show on Plan)</td></tr>
<tr><td colspan="2">No contaminated or hazardous soils are encountered within the project area.</td></tr>
<tr><td>6.</td><td>Describe the existing site drainage and natural hydrologic features. (Show on Plan).</td></tr>
<tr><td colspan="2">The project is located on the east side of Interstate 15, southerly of W. Lilac Road in the County of San Diego, State of California.

Under the existing conditions, there are three sub-basins on the project site - the northerly, central and southerly sub-basins. The northerly sub-basin drains the southwesterly along a web of natural drainage channels and into a major natural channel</td></tr>
</table>

along the westerly project boundary. The central sub-basin also drains southwesterly and into the same westerly natural channel along the westerly project boundary, approximately 1000’ southerly of the discharge point from the northerly sub-basin. The southerly sub-basin drains westerly across the project site and into a tributary of the westerly natural channel. Under the proposed conditions, the runoff pattern will be preserved where the runoff from the proposed pads and driveways will be designed to flow into the existing receiving sub-basin areas and be conveyed to the eventual discharge point exiting the site. Existing drainage consists of natural swales and ravines that convey the runoff from the site southwesterly into a natural drainage channel that is tributary to San Luis Rey River.		
7.	Describe site features and conditions that constrain, or provide opportunities for stormwater control, such as LID features.	
The project site is covered with heavy vegetation that prevent soil erosion from runoff discharge.		
8.	Is this project within the environmentally sensitive areas as defined on the maps in Appendix A of the *County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects?*	
		No
9.	Is this an emergency project?	
		No

CHANNELS & DRAINAGES

Complete the following checklist to determine if the project includes work in channels.

TABLE 3: PROJECT SPECIFIC STORMWATER ANALYSIS

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?		X		If YES go to 2 If NO go to 13.
2.	Will the project increase velocity or volume of downstream flow?				If YES go to 6.
3.	Will the project discharge to unlined channels?				If YES go to. 6.
4.	Will the project increase potential sediment load of downstream flow?				If YES go to 6.
5.	Will the project encroach, cross, realign, or cause other hydraulic changes to a stream that may affect downstream channel stability?				If YES go to 8.
6.	Review channel lining materials and design for stream bank erosion.				Continue to 7.
7.	Consider channel erosion control measures within the project limits as well as downstream. Consider scour velocity.				Continue to 8.
8.	Include, where appropriate, energy dissipation devices at culverts.				Continue to 9.
9.	Ensure all transitions between culvert outlets/headwalls/wingwalls and channels are smooth to reduce turbulence and scour.				Continue to 10.
10.	Include, if appropriate, detention facilities to reduce peak discharges.				Continue to 11.
11.	“Hardening“ natural downstream areas to prevent erosion is not an acceptable technique for protecting channel slopes, unless pre-development conditions are determined to be so erosive that hardening would be required even in the absence of the proposed development.				Continue to 12.
12.	Provide other design principles that are comparable and equally effective.				Continue to 13.
13.	End	X			

TEMPORARY CONSTRUCTION BMPS

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

- ☒ Silt Fence
- ☒ Fiber Rolls
- ☒ Street Sweeping and Vacuuming
- ☒ Storm Drain Inlet Protection
- ☒ Stockpile Management
- ☒ Solid Waste Management
- ☒ Stabilized Construction Entrance/Exit
- ☐ Dewatering Operations
- ☒ Desilting Basin
- ☒ Gravel Bag Berm
- ☐ Sandbag Barrier
- ☒ Material Delivery and Storage
- ☒ Spill Prevention and Control
- ☒ Concrete Waste Management
- ☒ Water Conservation Practices
- ☒ Paving and Grinding Operations
- ☒ Vehicle and Equipment Maintenance
- ☒ Any minor slopes created incidental to construction and not subject to a major or minor grading permit shall be protected by covering with plastic or tarp prior to a rain event, and shall have vegetative cover reestablished within 180 days of completion of the slope and prior to final building approval.

EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an "exceptional threat to water quality," and therefore require Advanced Treatment Best Management Practices during the construction phase.

TABLE 4: EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or turbidity? Current 303d list may be obtained from the following site: http://www.swrcb.ca.gov/tmdl/docs/303dlists2006/approved/r9_06_303d_reqtmdls.pdf		X	If YES, continue to 2. If NO, go to 5.
2.	Will the project disturb more than 5 acres, including all phases of the development?			If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity?			If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors k_f greater than or equal to 0.4?			If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	X		Document for Project Files by referencing this checklist.
6.	Project poses an "exceptional threat to water quality" and is required to use Advanced Treatment BMPs.			Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria

Exemption potentially available for projects that require advanced treatment: Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that shows to the County official's satisfaction that advanced treatment is not required

STEP 3

HYDROMODIFICATION DETERMINATION

The following questions provide a guide to collecting information relevant to hydromodification management issues.

TABLE 5: HYDROMODIFICATION DETERMINATION

	QUESTIONS	YES	NO	Information
1.	Will the project reduce the pre-project impervious area and are the unmitigated post-project outflows (outflows without detention routing) to each outlet location less as compared to the pre-project condition?	X		If NO, continue to 2. If YES, go to 7.
2.	Would the project site discharge runoff directly to an exempt receiving water, such as the Pacific Ocean, San Diego Bay, an exempt reservoir, or a tidally-influenced area?			If NO, continue to 3. If YES, go to 7.
3.	Would the project site discharge to a stabilized conveyance system, which has the capacity for the ultimate *Q10*, and extends to the Pacific Ocean, San Diego Bay, a tidally-influenced area, an exempt river reach or reservoir?			If NO, continue to 4. If YES, go to 7.
4.	Does the contributing watershed area to which the project discharges have an impervious area percentage greater than 70 percent?			If NO, continue to 5. If YES, go to 7.
5.	Is this an urban infill project which discharges to an existing hardened or rehabilitated conveyance system that extends beyond the "domain of analysis," where the potential for cumulative impacts in the watershed are low, and the ultimate receiving channel has a "Low" susceptibility to erosion as defined in the SCCWRP channel assessment tool?			If NO, continue to 6. If YES, go to 7.
6.	Project is required to manage hydromodification impacts.			Reference Appendix G "Hydromodification Management Plan" of the County SUSMP.
7.	Project is not required to manage hydromodification impacts.	X		Hydromodification Exempt. Keep on file.

An exemption is potentially available for projects that are required (No. 5. in Table 5 above) to manage hydromodification impacts: The project proponent may conduct an independent geomorphic study to determine the project's full hydromodification impact.

The study must incorporate sediment transport modeling across the range of geomorphically-significant flows and demonstrate to the County's satisfaction that the project flows and sediment reductions will not detrimentally affect the receiving water to qualify for the exemption.

STEP 4

POLLUTANTS OF CONCERN DETERMINATION

WATERSHED

Please check the watershed(s) for the project.

☐ San Juan 901	☐ Santa Margarita 902	☒ **San Luis Rey 903**	☐ Carlsbad 904
☐ San Dieguito 905	☐ Penasquitos 906	☐ San Diego 907	☐ Sweetwater 909
☐ Otay 910	☐ Tijuana 911	☐ Whitewater 719	☐ Clark 720
☐ West Salton 721	☐ Anza Borrego 722	☐ Imperial 723	

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

HYDROLOGIC SUB-AREA NAME AND NUMBER(S)

Number	Name
903.11	Sub-area San Luis Rey River
903.12	Bonsall

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

SURFACE WATERS that each project discharge point proposes to discharge to. List the impairments identified in Table 7.

SURFACE WATERS (river, creek, stream, etc.)	Hydrologic Unit Basin Number	Impairment(s) listed [303(d) listed waters or waters with established TMDLs]	Distance to Project
San Luis Rey River	903.1		Approximately 1.5miles south

http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303dlists2006/epa/r9_06_303d_reqtmdls.pdf

GROUND WATERS

Ground Waters	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH	POW	REC1	REC2	BIOL	WARM	COLD	WILD	RARE	SPWN
Lower San Luis	903.1	●	●	●												

http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/index.shtml

+ Excepted from Municipal ● Existing Beneficial Use ○ Potential Beneficial Use

PROJECT ANTICIPATED AND POTENTIAL POLLUTANTS

Using Table 6, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

TABLE 6: ANTICIPATED AND POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE

	General Pollutant Categories								
PDP Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development 1 acre or greater	P(1)	P(1)		P(2)	X	P(5)	X	P(3)	P(5)
Heavy industry /industrial development	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	
Hillside Development >5,000 ft^2	**X**	**X**			**X**	**X**	**X**		**X**
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	**X**	**P(1)**	**X**	**X(4)**	**X**	**P(5)**	**X**		

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

PROJECT POLLUTANTS OF CONCERN SUMMARY TABLE

Please summarize the identified project pollutant of concern by checking the appropriate boxes in the table below and list any surface water impairments identified. Pollutants anticipated to be generated by the project, which are also causing impairment of receiving waters, shall be considered the primary pollutants of concern. For projects where no primary pollutants of concern exist, those pollutants identified as anticipated shall be considered secondary pollutants of concern.

TABLE 7: PROJECT POLLUTANTS OF CONCERN

Pollutant Category	Anticipated (X)	Potential (P)	Surface Water Impairments
Sediments	X		
Nutrients	X		X
Heavy Metals	X		
Organic Compounds	X		
Trash & Debris	X		
Oxygen Demanding Substances	X		
Oil & Grease	X		
Bacteria & Viruses			
Pesticides	X		X

project clean water

clean water through local commitment and action

Home
Overview
Planning Efforts
Watersheds
San Juan
Santa Margarita
San Luis Rey
Carlsbad
San Dieguito
Penasquitos
San Diego
Pueblo
Sweetwater
Otay
Tijuana
For Kids
Report Dumping
Search

San Luis Rey River Watershed

Plan | Projects | Stewards

Hydrologic Unit 903.11 - 903.32

Hydrologic Areas:	Lower San Luis 903.1 Monserate 903.2 Warner Valley 903.3
Major Water Bodies:	San Luis Rey River and Lake Henshaw
CWA 303(d) List:	Pacific Ocean shoreline: indicator bacteria; San Luis Rey River (lower 13 miles): chloride; San Luis Rey River (lower 19 miles): total dissolved solids.
Major Impacts:	Surface water quality degradation, habitat loss, invasive species, channel bed erosion
Constituents of Concern:	Indicator bacteria and nutrients
Sources / Activities:	Agriculture, orchards, livestock, domestic animals, urban runoff, and septic systems

The San Luis Rey River Watershed is located in northern San Diego County. It is bordered to the north by the Santa Margarita River Watershed and to the south by the Carlsbad and San Dieguito River Watersheds. The San Luis Rey River originates in the Palomar and Hot Springs Mountains, both over 6,000 feet above mean sea level, as well as several other mountain ranges along the western border of the Anza Borrego Desert Park. The river extends over 55 miles across northern San Diego County forming a watershed with an area of approximately 360,000 acres or 562 square miles. The river ultimately discharges to the Pacific Ocean near the City of Oceanside. Of the nine major watersheds in the San Diego region, the San Luis Rey is the third largest.

About half (49%) of the land in the watershed is privately owned, 37% is publicly owned, and the remaining 14% consists of six federally recognized Tribal Indian Reservations. In the western half of the watershed, private ownership dominates. Population centers include the City of Oceanside and the unincorporated communities of Fallbrook, Bonsall, and Valley Center. Moving east through the watershed, public lands become increasingly dominant. Over 54% of the land in the watershed is vacant or undeveloped. The next largest land uses in the watershed are residential (15%) and agriculture (14%). Principal agricultural uses include cattle grazing, nurseries, citrus groves, and avocado groves.

The watershed is comprised of three Hydrologic Areas (HAs), which have been delineated by the San Diego Regional Water Quality Control Board based on drainage patterns: Lower San Luis (HA 903.1), Monserate (HA 903.2), and Warner Valley (HA 903.3). The Warner Valley HA is upstream of Lake Henshaw, a reservoir owned and operated by the Vista Irrigation District. Water from the San Luis Rey River is diverted approximately ten miles downstream of Henshaw Dam to serve the municipal drinking water needs of customers in Escondido and Vista.

Beneficial water uses within the San Luis Rey Watershed as designated in the State Water Resources Control Board's San Diego Region Basin Plan.

Beneficial Uses	**Inland Surface Water**	**Coastal Waters**	**Reservoirs and Lakes**	**Ground Water**
Municipal and Domestic Supply	x		x	x
Agricultural Supply	x		x	x
Industrial Service Supply	x		x	x
Industrial Process Supply			x	x
Hydropower Generation	x		x	
Navigation		x		
Freshwater Replenishment	x		x	x
Contact Water Recreation	x	x	x	
Non-Contact Water Recreation	x	x	x	
Commercial and Sport Fishing		x		
Biological Habitats of Special Signif.		x		
Warm Freshwater Habitat	x		x	
Cold Freshwater Habitat	x			
Wildlife Habitat	x	x	x	
Rare, Threatened, or End.	x	x	x	
Marine Habitat		x		
Migration of Aquatic Organisms		x		
Aquaculture		x		
Shellfish Harvesting		x		
Spawning, Reprod. and/ or Early Develop.		x		

STEP 5

LID AND SITE DESIGN STRATEGIES

Each numbered item below is a Low Impact Development (LID) requirement of the WPO. Please check the box(s) under each number that best describes the LID BMP(s) and Site Design Strategies selected for this project.

TABLE 8: LID AND SITE DESIGN

1. Conserve natural Areas, Soils, and Vegetation
☒ Preserve well draining soils (Type A or B)
☒ Preserve Significant Trees
☒ Preserve critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions
☐ Other. Description:
2. Minimize Disturbance to Natural Drainages
☒ Set-back development envelope from drainages
☐ Restrict heavy construction equipment access to planned green/open space areas
☐ Other. Description:
3. Minimize and Disconnect Impervious Surfaces (see 5)
☒ Clustered Lot Design
☐ Items checked in 5?
☐ Other. Description:
4. Minimize Soil Compaction
☒ Restrict heavy construction equipment access to planned green/open space areas
☒ Re-till soils compacted by construction vehicles/equipment
☐ Collect & re-use upper soil layers of development site containing organic Materials
☐ Other. Description:
5. Drain Runoff from Impervious Surfaces to Pervious Areas
LID Street & Road Design
☒ Curb-cuts to landscaping
☐ Rural Swales
☐ Concave Median
☐ Cul-de-sac Landscaping Design
☒ Other. Description: all runoff from streets and roadways are conveyed to proposed detention basins for settling and filtration prior to discharge off-site.
LID Parking Lot Design
☐ Permeable Pavements

☐ Curb-cuts to landscaping
☐ Other. Description:
LID Driveway, Sidewalk, Bike-path Design
☐ Permeable Pavements
☐ Pitch pavements toward landscaping
☐ Other. Description:
LID Building Design
☐ Cisterns & Rain Barrels
☐ Downspout to swale
☐ Vegetated Roofs
☐ Other. Description:
LID Landscaping Design
☒ Soil Amendments
☒ Reuse of Native Soils
☒ Smart Irrigation Systems
☒ Street Trees
☐ Other. Description:
6. Minimize erosion from slopes
☒ Disturb existing slopes only when necessary
☒ Minimize cut and fill areas to reduce slope lengths
☒ Incorporate retaining walls to reduce steepness of slopes or to shorten slopes
☒ Provide benches or terraces on high cut and fill slopes to reduce concentration of flows
☒ Rounding and shaping slopes to reduce concentrated flow
☒ Collect concentrated flows in stabilized drains and channels
☐ Other. Description:

STEP 6

SOURCE CONTROL

Please complete the checklist on the following pages to determine Source Control BMPs. Below is instruction on how to use the checklist. (Also see instructions on page 60 of the *SUSMP)*

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies and list in Table 9.

2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your Source Control Exhibit in Attachment B.

3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs into Table 9.

4. Use the format in Table 9 below to summarize the project Source Control BMPs. Incorporate all identified Source Control BMPs in your Source Control Exhibit in Attachment B.

TABLE 9: PROJECT SOURCE CONTROL BMPS

Potential source of runoff pollutants	*Permanent source control BMPs*	*Operational source control BMPs*
On-site storm drain inlets	Mark all inlets with the words “No Dumping! Flows to Bay” or similar.	Maintain and periodically repaint or replace inlet markings Provided stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, “Drainage System Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Landscape/Outdoor Pesticide Use	Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain,	Maintain landscaping using minimum or no pesticide use.

	land use, air movement, ecological consistency, and plant interactions.	

Describe your specific Source Control BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting Source Control BMPs or substituting alternatives.

Once the site is mass graded, and before slope planting and pad stabilization is established, the disturbed areas should be hydroseeded and/or stabilized with BFM to prevent sentiment generation and transport. The hydroseed mix should be native pest and drought tolerant species to reduce the amount of irrigation that can generate runoff and erosion, and the amount of pesticides and fertilizer that can be carried by the runoff to downstream water bodies. Due to large size of the site, people accessing the site may left behind trash and debris that may accumulate at drain inlets and enter the storm drain and, subsequently, be conveyed to downstream water bodies. Prohibitive signs should be installed at the drain inlets to remind people not to leave trash, debris and other pollutants behind, especially near the inlets that can enter the drainage system. The site manager should be vigilant to keep the site clean, especially around drain inlets and prior and post runoff producing storms.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in SUSMP Table and Narrative	4 Operational BMPs—Include in SUSMP Table and Narrative
☒ A. **On-site storm drain inlets**	☒ **Locations of inlets.**	☒ **Mark all inlets with the words "No Dumping! Flows to Bay" or similar.**	☒ **Maintain and periodically repaint or replace inlet markings.** ☒ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☒ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ❑ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
❑ B. **Interior floor drains and elevator shaft sump pumps**		❑ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	❑ **Inspect and maintain drains to prevent blockages and overflow.**
❑ C. **Interior parking garages**		❑ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	❑ **Inspect and maintain drains to prevent blockages and overflow.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in SUSMP Table and Narrative	4 Operational BMPs—Include in SUSMP Table and Narrative
❑ D1. **Need for future indoor & structural pest control**		❑ **Note building design features that discourage entry of pests.**	❑ **Provide Integrated Pest Management information to owners, lessees, and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in SUSMP Table and Narrative	4 Operational BMPs—Include in SUSMP Table and Narrative
☒ D2. **Landscape/ Outdoor Pesticide Use** **Note: Should be consistent with project landscape plan (if applicable).**	☒ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☒ **Show self-retaining landscape areas, if any.** ☒ **Show stormwater treatment facilities.**	**State that final landscape plans will accomplish all of the following:** ☒ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☒ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☒ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☒ **Consider using pest-resistant plants, especially adjacent to hardscape.** ☒ **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☒ **Maintain landscaping using minimum or no pesticides.** ❑ **See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ❑ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in SUSMP Table and Narrative	4 Operational BMPs—Include in SUSMP Table and Narrative
❑ E. **Pools, spas, ponds, decorative fountains, and other water features.**	❑ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.**	❑ **If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	❑ **See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
❑ F. **Food service**	❑ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ❑ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	❑ **Describe the location and features of the designated cleaning area.** ❑ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	❑

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in SUSMP Table and Narrative	4 Operational BMPs—Include in SUSMP Table and Narrative
❑ G. **Refuse areas**	❑ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ❑ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ❑ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	❑ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ❑ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	❑ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in SUSMP Table and Narrative	4 Operational BMPs—Include in SUSMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	❑ **Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

❑ J. Vehicle and Equipment Cleaning	❑ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle /equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	❑ If a car wash area is not provided, describe measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ❑ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. ❑ Car dealerships and similar may rinse cars with water only. ❑ See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

❑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the SUSMP report, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.**

❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[1] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Business Guide Sheet, "Automotive Service—Service Stations" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[1] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

❑ M. Loading Docks	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible. Direct connections to storm drains from depressed loading docks are prohibited. ❑ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ❑ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		❑ Move loaded and unloaded items indoors as soon as possible. ❑ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
❑ N. Fire Sprinkler Test Water		❑ Provide a means to drain fire sprinkler test water to the sanitary sewer.	❑ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

O. **Miscellaneous Drain or Wash Water** ❑ **Boiler drain lines** ❑ **Condensate drain lines** ❑ **Rooftop equipment** ❑ **Drainage sumps** ❑ **Roofing, gutters, and trim.**		❑ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ❑ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ❑ **Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ❑ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ❑ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.**	
❑ P. **Plazas, sidewalks, and parking lots.**			❑ **Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.**

STEP 7

LID AND TREATMENT CONTROL SELECTION

A treatment control BMP and/or LID facility must be selected to treat the project pollutants of concern identified in Table 7 "Project Pollutants of Concern". A treatment control facility with a high or medium pollutant removal efficiency for the project's most significant pollutant of concern shall be selected. It is recommended to use the design procedure in Chapter 4 of the SUSMP to meet NPDES permit LID requirements, treatment requirements, and flow control requirements. If your project does not utilize this approach, the project will need to demonstrate compliance with LID, treatment and flow control requirements. Review Chapter 2 "Selection of Stormwater Treatment Facilities" in the SUSMP to assist in determining the appropriate treatment facility for your project.

Will this project be utilizing the unified LID design procedure as described in Chapter 4 of the Local SUSMP? *(If yes, please document in Attachment D following the steps in Chapter 4 of the County SUSMP)*	
Yes	
If this project is not utilizing the unified LID design procedure, please describe how the alternative treatment facilities will comply with applicable LID criteria, stormwater treatment criteria, and hydromodification management criteria.	

- Indicate the project pollutants of concern (POCs) from Table 7 in Column 2 below.

TABLE 10: GROUPING OF POTENTIAL POLLUTANTS of Concern (POCs) by fate during stormwater treatment

Pollutant	Check Project Specific POCs	Coarse Sediment and Trash	Pollutants that tend to associate with fine particles during treatment	Pollutants that tend to be dissolved following treatment
Sediment	X	X	X	
Nutrients	X		X	X
Heavy Metals	X		X	
Organic Compounds	X		X	
Trash & Debris	X	X		
Oxygen Demanding	X		X	
Bacteria			X	
Oil & Grease	X		X	
Pesticides	X		X	

- Indicate the treatment facility(s) chosen for this project in the following table.

TABLE 11: GROUPS OF POLLUTANTS and relative effectiveness of treatment facilities

Pollutants of Concern	Bioretention Facilities (LID)	Settling Basins (Dry Ponds)	Wet Ponds and Constructed Wetlands	Infiltration Facilities or Practices (LID)	Media Filters	Higher-rate biofilters*	Higher-rate media filters*	Trash Racks & Hydro -dynamic Devices	Vegetated Swales
Coarse Sediment and Trash	**High**	**High**	High	**High**	High	High	High	High	High
Pollutants that tend to associate with fine particles during treatment	**High**	**High**	High	**High**	High	Medium	Medium	Low	Medium
Pollutants that tend to be dissolved following treatment	**Medium**	**Low**	Medium	**High**	Low	Low	Low	Low	Low

- Please check the box(s) that best describes the Treatment BMP(s) and/or LID BMP selected for this project.

TABLE 12: PROJECT LID AND TC-BMPS

LID and TC-BMP Type	Water Quality Treatment Only	Hydromodification Flow Control
Bioretention Facilites (LID)		
☒ Bioretention area	X	
☐ Flow-through Planter		
☐ Cistern with Bioretention		
Settling Basins (Dry Ponds)		
☒ Extended/dry detention basin with grass/vegetated lining	X	X
☒ Extended/dry detention basin with impervious lining	X	
Infiltration Devices (LID)		
☐ Infiltration basin		
☐ Infiltration trench		
☐ Other________________________________		
Wet Ponds and Constructed Wetlands		
☐ Wet pond/basin (permanent pool)		
☐ Constructed wetland		
Vegetated Swales (LID[(1)])		
☐ Vegetated Swale		

Media Filters		
☐ Austin Sand Filter		
☐ Delaware Sand Filter		
☐ Multi-Chambered Treatment Train (MCTT)		
Higher-rate Biofilters		
☐ Tree-pit-style unit		
☐ Other___________________________		
Higher-rate Media Filters		
☐ Vault-based filtration unit with replaceable cartridges		
☐ Other___________________________		
Hydrodynamic Separator Systems		
☐ Swirl Concentrator		
☐ Cyclone Separator		
Trash Racks		
☐ Catch Basin Insert		
☐ Catch Basin Insert w/ Hydrocarbon boom		
☐ Other___________________________		

(1) Must be designed per SUSMP "Vegetated Swales" design criteria for water quality treatment credit (p. 65)

For design guidelines and calculations refer to Chapter 4 "Low Impact Development Design Guide" in the SUSMP. Please show all calculations and design sheets for all treatment facilities proposed in Attachment D.

- Create a Construction Plan SWMP Checklist for your project.

Instructions on how to fill out table

1. Number and list each measure or BMP you have specified in your SWMP in Columns 1 and Maintenance Category in Column 3 of the table. Leave Column 2 blank.

2. When you submit construction plans, duplicate the table (by photocopy or electronically). Now fill in Column 2, identifying the plan sheets where the BMPs are shown. List all plan sheets on which the BMP appears. This table must be shown on the front sheet of the grading and improvement plans.

Stormwater Treatment Control and LID BMP's			
Description / Type	Sheet	Maintenance Category	Revisions
Bioretention Area		1	
Settling Basin - Detention Basins w/vegetated lining Settling Basin – Dry Detention Basin with Impervious lining (Sediment Traps)		3	

The selected vegetated swales have high efficiency treating sediments (pollutant of concern per www.projectcleanwater.org) and trash& debris, median efficiency treating all other types of pollutants, including nutrients and bacteria & viruses (pollutants of concern per www.projectcleanwater.org). The proposed vegetated swales along with landscaped areas will also provide water quality runoff retention storage space within the porous spaces in the underlying soft soil, and over time, allowing the water quality runoff volume to slowing infiltrating into the compacted soil. The bioretention and infiltration capabilities of the proposed vegetated swale and landscaped areas have high efficiencies in removed all anticipated and potential pollutants associated with the proposed grading construction.

STEP 8

OPERATION AND MAINTENANCE

- Please check the box that best describes the maintenance mechanism(s) for this project.

TABLE 13: PROJECT BMP CATEGORY

CATEGORY	SELECTED		BMP Description
	YES	NO	
First	X		Irrigation and Bioretention, Detention Basins, sediment traps
Second[1]	X		
Third[2]	X		
Fourth			

Note:

1. A recorded maintenance agreement will be required.
2. Project will be required to establish or be included in a Stormwater Maintenance Assessment District for the long-term maintenance of treatment BMPs.

- Please list all individual LID and Treatment Control BMPs (TC-BMPs) incorporated into project. Please ensure the "BMP Identifier" is consistent with the legend in Attachment C "LID and/or TC-BMP Exhibit". Please attach the record plan sheets upon completion of project and amend the Major SWMP where appropriate. For each type of LID or TC-BMP provide an inspection sheet in Attachment F "Maintenance Plan".

TABLE 14: PROJECT SPECIFIC LID AND TC-BMPS

BMP Identifier*	LID or TC-BMP Type	BMP Pollutant of Concern Efficiency (H,M,L) – Table 11	Final Construction Date *(to be completed by County inspector)*	Final Construction Inspector Name *(to be completed by County inspector)*
Irrigation and Bioretention in landscaped areas	Irrigation and Bioretention	Sediment (H) Nutrients (H) Bacteria & Viruses (H)		
Detention basins	Settling and filtration	Sediment (H) Nutrients (H) Bacteria & Viruses (H)		
Sediment Traps	Settling	Sediment (H) Nutrients (H) Bacteria & Viruses (H)		

Responsible Party for Long-term Maintenance:

Identify the parties responsible for long-term maintenance of the BMPs identified above and Source Controls specified in Attachment B. Include the appropriate written agreement with the entities responsible for O&M in Attachment F. Please see Chapter 5 "Private Ownership and Maintenance" on page 94 of the County SUSMP for appropriate maintenance mechanisms.

Name:	Randy Goodson
Company Name:	Accretive Capital Partners, LLC
Phone Number:	858-546-0700
Street Address:	3655 Nobel Drive, Suite 650
City/State/Zip:	San Diego, Ca 92122
Email Address:	

Funding Source:

Provide the funding source or sources for long-term operation and maintenance of each BMP identified above. By certifying the Major SWMP the applicant is certifying that the funding responsibilities have been addressed and will be transferred to future owners.

The primary funding mechanism will be a special assessment under the authority of the Flood Control District. The assessment will be collected with property tax. Because this primary funding mechanism will require substantial amount of time to establish and collect assessments, a developer fee is required to cover the initial maintenance period of 24 months

ATTACHMENTS

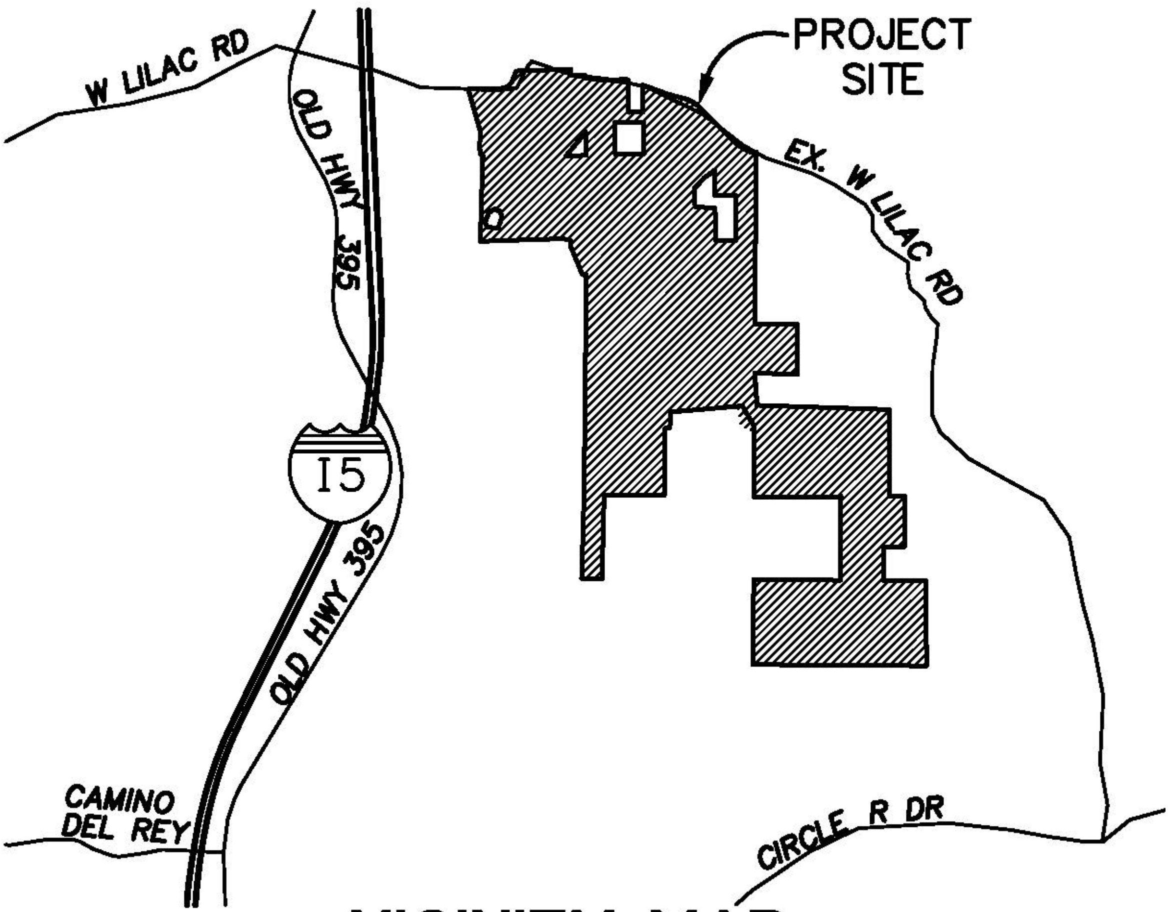
Please include the following attachments.

ATTACHMENT		COMPLETED	N/A
A	Project Location Map	X	
B	Source Control Exhibit	X	
C	LID and/or TC-BMP Exhibit	X	
D	Drainage Management Area (DMA) Maps, Sizing Design Calculations and BMP/IMP Design Details	X	
E	Geotechnical Certification Sheet		X
F	Maintenance Plan	X	
G	Tracking Report	X	
H	Addendum		

Note: Attachments B and C may be combined.

ATTACHMENT A

Project Location Map



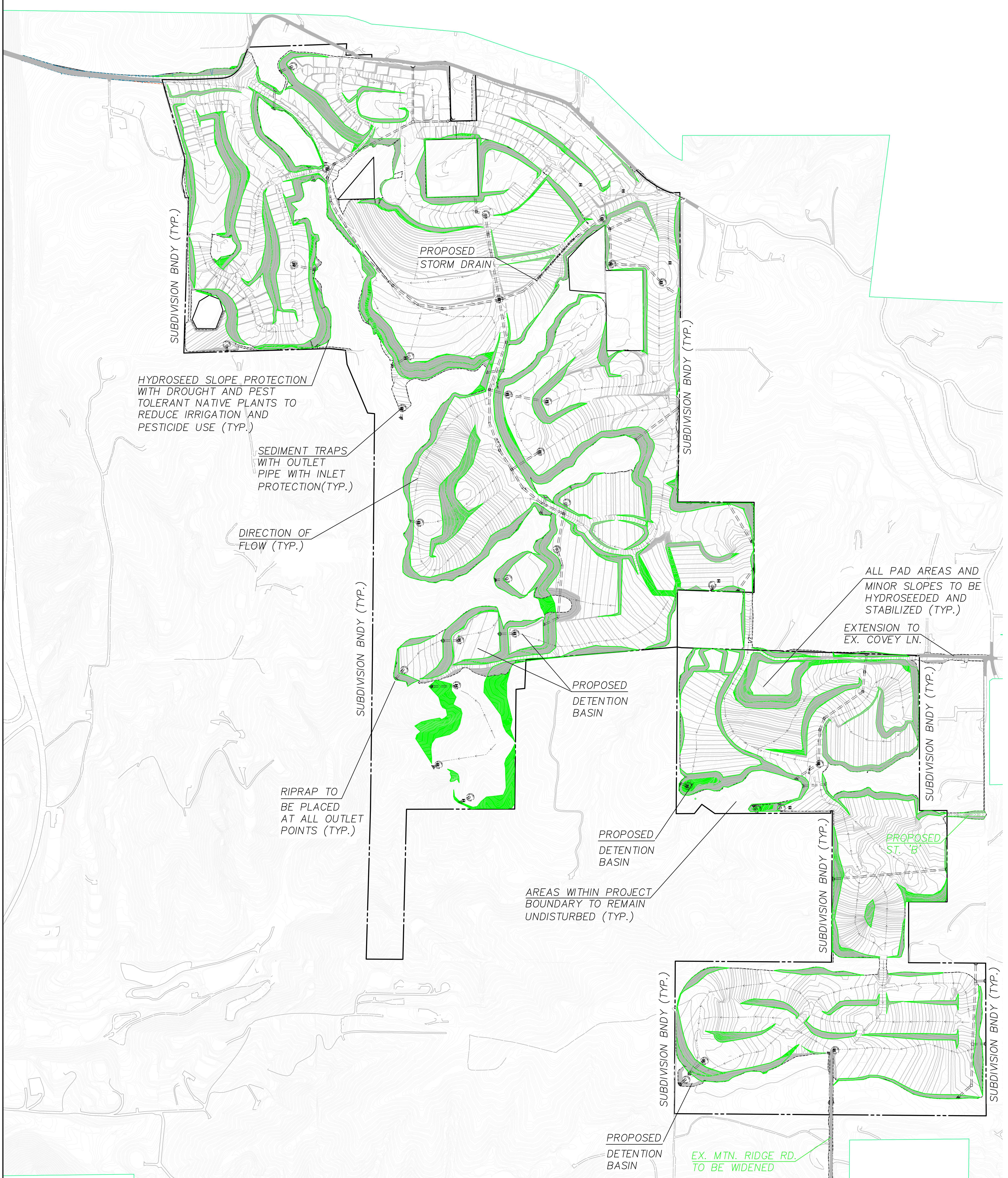
VICINITY MAP

NOT TO SCALE

ATTACHMENT B

Source Control Exhibit

SOURCE CONTROL BMP MAP FOR LILAC HILLS RANCH, TM 5571 RPL-2



LEGEND

HYDROSEED/SLOPE PLANTING W/ NATIVE DROUGHT AND PEST TOLLERANT PLANTS

UNDISTURBED AREAS

PROPOSED STORM DRAIN

PROPOSED STORM DRAIN INLETS WITH "NO DUMPING SIGNS OR STAMPS"

SCALE: 1"= 400'

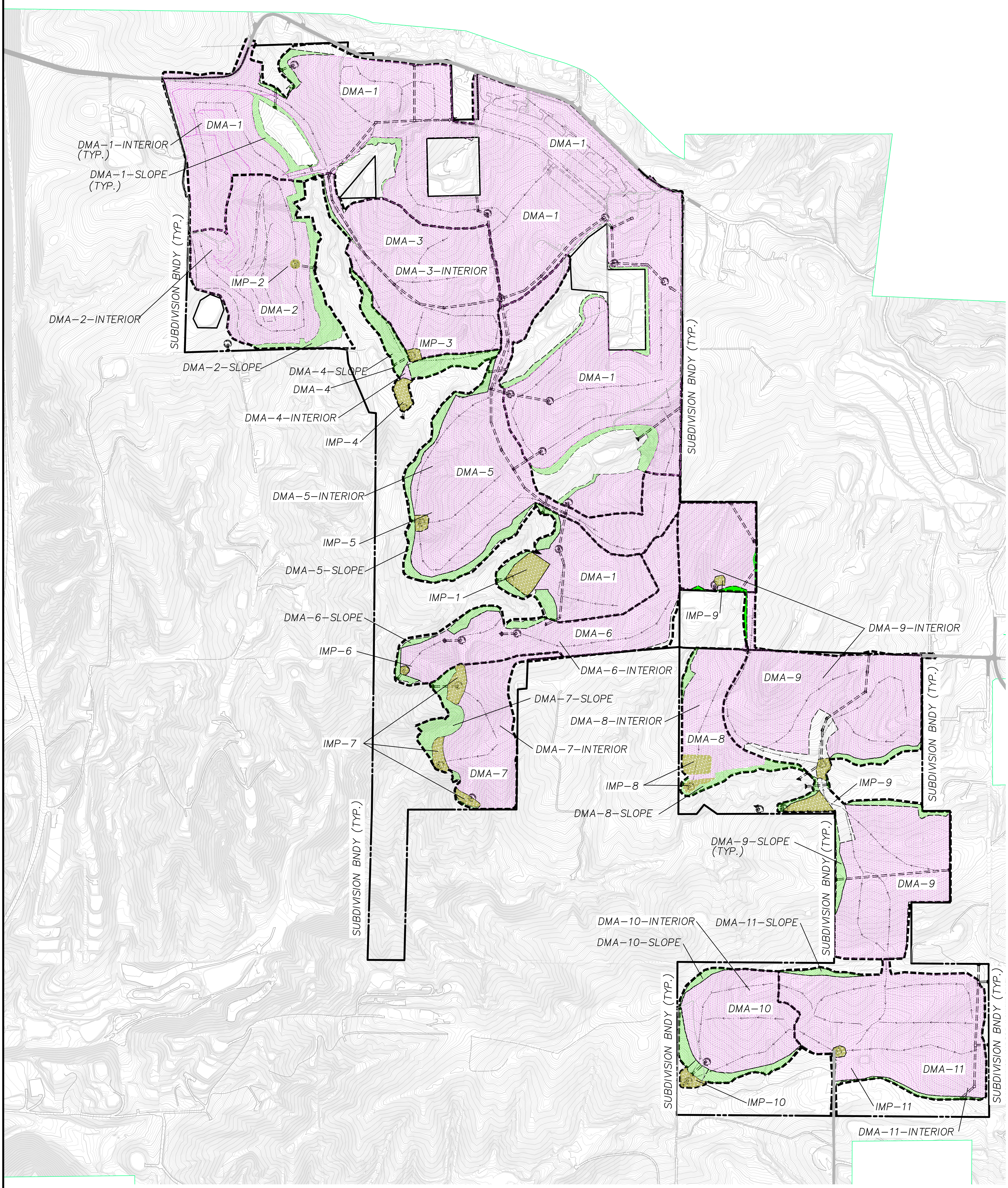
LANDMARK CONSULTING
Planning Engineering Surveying
9555 Genesee Avenue, Suite 200
San Diego, CA 92121, (858) 587-8070

J.N.: 103-7

ATTACHMENT C

Drainage Management Area (DMA) Exhibit

DMA SITE PLAN FOR
LILAC HILLS RANCH, TM 5571 RPL-1



LEGEND

- SELF TREATING AREA
- IMP AREA
- INTERIOR AREA DRAINING INTO IMP AREA

N
SCALE: 1"= 400'

LANDMARK CONSULTING
Planning Engineering Surveying
9555 Genesee Avenue, Suite 200
San Diego, CA 92121, (858) 587-8070

J.N.: 103-7

ATTACHMENT D

Sizing Design Calculations and TC-BMP/LID Design Details

(Provide BMP Sizing Calculator results and/or continuous simulation modeling results, if applicable)

DMA 1

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-1-SLOPE	10.8

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-1-INTERIOR	150.9	HYDROSEEDED/ LANDSCAPED	0.1	15.1	IMP SOIL TYPE	IMP NAME			
					B	IMP 1			
					IMP SIZING FACTOR		MIN. VOL (Ac)	PROPOSED VOL (Ac)	IMP VOL (Ac)
			TOTAL	15.1	0.04		0.6	1.8*	1.8

- Detention basin also sized for 100-year discharge vol. attenuation.

DMA 2

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-2-SLOPE	3.6

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-2-INTERIOR	26.2	HYDROSEEDED/ LANDSCAPED	0.1	2.6	IMP SOIL TYPE	IMP NAME			
					B	IMP 2			
					IMP SIZING FACTOR		MIN. AREA (Ac)	PROPOSED AREA (Ac)	IMP AREA (Ac)
			TOTAL	2.6	0.04		0.1	0.2	0.2

DMA 3

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-3-SLOPE	0

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-3-INTERIOR	31.8	HYDROSEEDED/ LANDSCAPED	0.1	3.2	IMP SOIL TYPE	IMP NAME			
					B	IMP 3			
					IMP SIZING FACTOR		MIN. AREA (Ac)	PROPOSED AREA (Ac)	IMP AREA (Ac)
			TOTAL	3.2	0.04		0.13	0.2	0.2

DMA 4

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-4-SLOPE	3.5

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-4-INTERIOR	0.2	HYDROSEEDED/ LANDSCAPED	0.1	0.02	IMP SOIL TYPE	IMP NAME			
					B	IMP 4			
					IMP SIZING FACTOR		MIN. AREA (sf)	PROPOSED AREA (sf)	IMP AREA (sf)
			TOTAL	0.02	0.04		35	30500	30500

DMA 5

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-5-SLOPE	4.1

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-5-INTERIOR	44.8	HYDROSEEDED/ LANDSCAPED	0.1	4.5	IMP SOIL TYPE	IMP NAME			
					B	IMP 5			
					IMP SIZING FACTOR		MIN. AREA (Ac)	PROPOSED AREA (Ac)	IMP AREA (Ac)
			TOTAL	4.5	0.04		0.18	0.3	0.3

DMA 6

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-6-SLOPE	1.7

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-6-INTERIOR	22.2	HYDROSEEDED/ LANDSCAPED	0.1	2.2	IMP SOIL TYPE	IMP NAME			
					B	IMP 6			
					IMP SIZING FACTOR		MIN. AREA (Ac)	PROPOSED AREA (Ac)	IMP AREA (Ac)
			TOTAL	2.2	0.04		0.1	2.5	2.5

DMA 7

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-7-SLOPE	2.8

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-7-INTERIOR	16.4	HYDROSEEDED/ LANDSCAPED	0.1	1.6	IMP SOIL TYPE	IMP NAME			
					B	IMP 7			
					IMP SIZING FACTOR		MIN. AREA (Ac)	PROPOSED AREA (Ac)	IMP AREA (Ac)
			TOTAL	1.6	0.04		0.06	0.1	0.1

DMA 8

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-8-SLOPE	1.3

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-8-INTERIOR	12.0	HYDROSEEDED/ LANDSCAPED	0.1	1.2	IMP SOIL TYPE	IMP NAME			
					B	IMP 8			
					IMP SIZING FACTOR		MIN. AREA (Ac)	PROPOSED AREA (Ac)	IMP AREA (Ac)
			TOTAL	1.2	0.04		0.05	0.1	0.1

DMA 9

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-9-SLOPE	3.6

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-9-INTERIOR	72.3	HYDROSEEDED/ LANDSCAPED	0.1	7.2	IMP SOIL TYPE	IMP NAME			
					B	IMP 9			
					IMP SIZING FACTOR		MIN. AREA (Ac)	PROPOSED AREA (Ac)	IMP AREA (Ac)
			TOTAL	7.2	0.04		0.3	0.5	0.5

DMA 10

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-10-SLOPE	3.5

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-10-INTERIOR	16.5	HYDROSEEDED/ LANDSCAPED	0.1	1.6	IMP SOIL TYPE	IMP NAME			
					B	IMP 10			
					IMP SIZING FACTOR		MIN. AREA (Ac)	PROPOSED AREA (Ac)	IMP AREA (Ac)
			TOTAL	1.6	0.04		0.07	0.1	0.1

DMA 11

SELF-TREATING AREAS – Vegetated manufactured slopes discharge to natural areas

DMA NAME	AREA (Ac)
DMA-11-SLOPE	0.6

SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)

AREAS DRAINING TO SELF-RETAINING AREAS (N/A)

DMA NAME	AREA (Ac)	POST-DEV. SRUFACE TYPE	RUNOFF FACTOR	RECEIVING SELF-RETAINING DMA	AREA(Ac)

INTERGRATED MANAGEMENT PRACTICE

DMA NAME	DMA AREA (AC)	POST-DEV SURFACE TYPE	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR (AC)					
DMA-11-INTERIOR	37.1	HYDROSEEDED/ LANDSCAPED	0.1	3.7	IMP SOIL TYPE	IMP NAME			
					B	IMP 11			
					IMP SIZING FACTOR		MIN. AREA (Ac)	PROPOSED AREA (Ac)	IMP AREA (Ac)
			TOTAL	3.7	0.04		0.15	0.2	0.2

ATTACHMENT E

Geotechnical Certification Sheet

The design of stormwater treatment and other control measures proposed in this plan requiring specific soil infiltration characteristics and/or geological conditions has been reviewed and approved by a registered Civil Engineer, Geotechnical Engineer, or Geologist in the State of California.

________________________________ _____________

Name Date

N/A, even though the project proposes infiltration BMPs such as the Retention/Irrigation, the anticipated water quality runoff volume is not required to infiltrate into the underlying native soil. The runoff only needs to infiltrate into the top soil section and be discharge to downstream channel via outlet pipe. The pad retention/irrigation BMP will retain the water quality runoff volume.

ATTACHMENT F

Maintenance Plan

(Use Chapter 5 of the SUSMP as guidance in developing your Maintenance Plan)

I. Inspection, Maintenance Log and Self-Verification Forms

Black forms and logs are located at the end of the Attachment F

II. Updates and Revisions

Updates and revisions to this SWMP shall be inserted into the SWMP and be stored on site.

III. Introduction

The project is located on the southerly side of W. Lilac Road, easterly of I-15, in the community of Valley Center, County of San Diego. The project consists of the subdividing of approximately 610.7 acres of rural agricultural and residential land into 27 lots including 15 super lots for future master-planned community use, 12 open space lots and 1 roadway lot for backbone access to the 15 super lots.

The proposed construction activities include the mass grading of the master-planned community super lots, and the paving of the backbone road and detention and HMP mitigation facilities. No home construction is proposed for this project.

The only impervious area of the development will be the roadways. The remaining mass-graded areas will be hydroseeded and stabilized until the individual parcels are sold to future builder for future development. Separate SWMP will be required for these future developments.

IV. Designated Responsible Person:

Randy Goodson Accretive Capital Partners, LLC 12275 El Camino Real, Suite 110 San Diego, Ca 92130 858-546-0700

V. Summary of Drainage Areas and Stormwater facilities

See BMP Site Map for Lilac Hills Ranch in Attachment C and D for detailed depictions of pervious and impervious areas and drainage patterns

VI. General Maintenance Requirements:

BMP CATEGORY (FIRST)	**MAINTENANCE ACTIVITIES**	ANNUAL COST
BIO-FILTERATION AREAS	- CUT VEGETATION IN CHANNEL TO 8" or 6" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM CHANNEL AS NECESSARY - BACKFILL BURROW HOLES AS NECESSARY	$38,500
	TOTAL	**$ 38,500**
MAINTENANCE RESPONSIBILITY	The County should have only minimal concern for ongoing maintenance. The property owners and HOA can naturally be expected to do so as a requirement of taking care of their property.	
BMP CATEGORY (SECOND)	**MAINTENANCE ACTIVITIES**	ANNUAL COST
SEDIMENT TRAPS (15 total)	- INSPECT STRUCTURAL INTEGRITY - REMOVE SEDIMENT FROM BASIN AS NECESSARY	$18,000
	TOTAL	**$18,000**
MAINTENANCE RESPONSIBILITY	The County needs to assure ongoing maintenance. It is appropriate for the HOA to be given primary responsibility for maintenance. The County needs to be able to step in and perform the maintenance if HOA fails, and needs to have security to provide funding for such maintenance.	
BMP CATEGORY (THIRD)	**MAINTENANCE ACTIVITIES**	ANNUAL COST
DETENTION BASIN (1 total)	- CUT VEGETATION IN BASIN TO 8" HEIGHT - RESEED/VEGETATE BARE SPOTS AS NECESSARY - REMOVE SEDIMENT FROM BASIN AS NECESSARY - INSPECT STRUCTURAL INTEGRITY - BACKFILL BURROW HOLES AS NECESSARY	$10,000
MAINTENANCE RESPONSIBILITY	The County needs to assure ongoing maintenance is heightened, to the point that the County is willing to take on this responsibility. The master HOA will be primarily responsible for maintenance. A permanent funding mechanism needs to be established. A special assessment district will be established for this project, the assessment will be collected with property tax.	
	TOTAL	**$10,000**
	GRAND TOTAL	**$66,500**

ATTACHMENT G

Treatment Control BMP Certification for DPW Permitted Land Development Projects

County of San Diego

DEPARTMENT OF PUBLIC WORKS

Treatment Control BMP Certification for DPW Permitted Land Development Projects

Permit Number____________________ SWMP #__________________________

Project Name____

Location / Address ____

Responsible Party for Construction Phase

Developer's Name: ____

Address: ____

City ____________________ State __________________________Zip______________

Email Address: ____

Phone Number: ____

Engineer of Work: ____

Engineer's Phone Number: ____

Responsible Party for Perpetual Maintenance

Owner's Name(s)*____

Address: ____

City ____________________ State __________________________Zip______________

Email Address: ____

Phone Number: ____

* Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information of president at time of project closeout.

Maintenance Agreement No.: ______________________________

Percent Impervious Before Construction: %____________________
Percent Impervious After Construction: %_____________________

Proposed Disturbed Area: __________Acres

Hydromodification Management:
Yes ☐ or No ☐

Primary or Secondary Pollutants of Concerns *(check all that apply)*

- ☐ Sediment
- ☐ Organic Compounds
- ☐ Oxygen Demanding Substances
- ☐ Bacteria and Viruses
- ☐ Nutrients
- ☐ Trash and Debris
- ☐ Oil and Grease
- ☐ Pesticides

Site Layout Strategies *(check all that apply)*

- ☐ Conserve Natural Areas
- ☐ Minimize and Disconnect Imp.Surfaces
- ☐ Minimize erosion from slopes
- ☐ Minimize Disturbance to Natural Areas
- ☐ Minimize Soil Compaction

Disperse Runoff from Impervious Surfaces to Pervious *(check all that apply)*

- ☐ Use of pervious surfaces
- ☐ Parking Lot Design
- ☐ Building Design
- ☐ Street and Road Design
- ☐ Driveway, Sidewalk, Bikepath Design
- ☐ Landscape Design

Source BMPs *(check all that apply)*

- ☐ Storm Drain Inlets
- ☐ Interior Parking Garages
- ☐ Landscape/Outdoor Pesticide Use
- ☐ Food Service
- ☐ Industrial Processes
- ☐ Vehicle and Equipment Cleaning
- ☐ Fuel Dispensing Areas
- ☐ Fire Sprinkler Test Water
- ☐ Plazas, sidewalks, and parking lots
- ☐ Interior Floor Drains
- ☐ Indoor & Structural Pest Control
- ☐ Pools, spas, etc.
- ☐ Refuse Areas
- ☐ Outdoor Storage of Equipment and Materials
- ☐ Vehicle/ Equipment Repair and Maintenance
- ☐ Loading Docks
- ☐ Misc. drain or wash water

Treatment Control, Hydromodification and LID BMPs

BMP Identifier: (Identifier to match TCBMPs on TCBMP Table.)	Type	Record Plan Page for TCBMP	BMP Pollutant of Concern Efficiency (H,M,L)

(Add sheet for all additional BMPs)
The Maintenance Agreement has been recorded. Yes ☐ or No ☐

I certify that the above items for this project are in substantial conformance with the approved plans. Yes ☐ or No ☐

Please sign your name and seal. [SEAL]

Engineer's Print Name: ______________________________

Engineer's Signed Name: ______________________________

Date: ______________________________

Submittals Required with Certification:

- Copy of the final approved SWMP.
- Copy of the approved record plan showing Stormwater TCBMP Table and the location of each verified as-built TCBMP.
- Copy of the specification sheets for the verified proprietary TCBMPs
- Recorded Maintenance Agreement (Category 1 or 2 only)
- Photograph(s) of TCBMP(s)

COUNTY - OFFICIAL USE ONLY:

For PDCI:
PDCI Inspector:______________________________

Date Project has/expects to close:______________________

Date Certification received from EOW:__________________

DPW Inspector concurs that every noted BMP on the plan and the SWMP or SWMP Addendum is installed onsite through field verification and completed as certified: Yes ☐ or No ☐

PDCI Inspector's Signed Name: ______________________ Date: __________

FOR WPP:
Date Received from PDCI:__________________________

WPP Submittal Reviewer:__________________________

WPP Reviewer concurs that the provided TC-BMP information is acceptable to enter into the TC-BMP Maintenance verification inventory. Yes ☐ or No ☐

WPP Reviewer's Signed Name: ______________________ Date:__________

4 of 4

ATTACHMENT H

HMP Exemption Documentation

(if applicable)

ATTACHMENT I

Addendum

Retention/Irrigation

Description

Retention/irrigation refers to the capture of stormwater runoff in a holding pond and subsequent use of the captured volume for irrigation of landscape of natural pervious areas. This technology is very effective as a stormwater quality practice in that, for the captured water quality volume, it provides virtually no discharge to receiving waters and high stormwater constituent removal efficiencies. This technology mimics natural undeveloped watershed conditions wherein the vast majority of the rainfall volume during smaller rainfall events is infiltrated through the soil profile. Their main advantage over other infiltration technologies is the use of an irrigation system to spread the runoff over a larger area for infiltration. This allows them to be used in areas with low permeability soils.

Capture of stormwater can be accomplished in almost any kind of runoff storage facility, ranging from dry, concrete-lined ponds to those with vegetated basins and permanent pools. The pump and wet well should be automated with a rainfall sensor to provide irrigation only during periods when required infiltration rates can be realized. Generally, a spray irrigation system is required to provide an adequate flow rate for distributing the water quality volume (LCRA, 1998). Collection of roof runoff for subsequent use (rainwater harvesting) also qualifies as a retention/irrigation practice.

This technology is still in its infancy and there are no published reports on its effectiveness, cost, or operational requirements. The guidelines presented below should be considered tentative until additional data are available.

California Experience

This BMP has never been implemented in California, only in the Austin, Texas area. The use there is limited to watersheds where no increase in pollutant load is allowed because of the sensitive nature of the watersheds.

Advantages

- Pollutant removal effectiveness is high, accomplished primarily by: (1) sedimentation in the primary storage facility; (2) physical filtration of particulates through the soil profile; (3) dissolved constituents uptake in the vegetative root zone by the soil-resident microbial community.

Design Considerations

- Soil for Infiltration
- Area Required
- Slope
- Environmental Side-effects

Targeted Constituents

☑	Sediment	■
☑	Nutrients	■
☑	Trash	■
☑	Metals	■
☑	Bacteria	■
☑	Oil and Grease	■
☑	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

The hydrologic characteristics of this technique are effective for simulating pre-developed watershed conditions through: (1) containment of higher frequency flood volumes (less than about a 2-year event); and (2) reduction of flow rates and velocities for erosive flow events.

- Pollutant removal rates are estimated to be nearly 100% for all pollutants in the captured and irrigated stormwater volume. However, relatively frequent inspection and maintenance is necessary to assure proper operation of these facilities.

- This technology is particularly appropriate for areas with infrequent rainfall because the system is not required to operate often and the ability to provide stormwater for irrigation can reduce demand on surface and groundwater supplies.

Limitations

- Retention-irrigation is a relatively expensive technology due primarily to mechanical systems, power requirements, and high maintenance needs.

- Due to the relative complexity of irrigation systems, they must be inspected and maintained at regular intervals to ensure reliable system function.

- Retention-irrigation systems use pumps requiring electrical energy inputs (which cost money, create pollution, and can be interrupted). Mechanical systems are also more complex, requiring skilled maintenance, and they are more vulnerable to vandalism than simpler, passive systems.

- Retention-irrigation systems require open space for irrigation and thus may be difficult to retrofit in urban areas.

- Effective use of retention irrigation requires some form of pre-treatment of runoff flows (i.e., sediment forebay or vegetated filter) to remove coarse sediment and to protect the long-term operating capacity of the irrigation equipment.

- Retention/irrigation BMPs capture and store water that, depending on design may be accessible to mosquitoes and other vectors for breeding.

Design and Sizing Guidelines

- Runoff Storage Facility Configuration and Sizing - Design of the runoff storage facility is flexible as long as the water quality volume and an appropriate pump and wet well system can be accommodated.

- Pump and Wet Well System - A reliable pump, wet well, and rainfall or soil moisture sensor system should be used to distribute the water quality volume. These systems should be similar to those used for wastewater effluent irrigation, which are commonly used in areas where "no discharge" wastewater treatment plant permits are issued.

- Detention Time - The irrigation schedule should allow for complete drawdown of the water quality volume within 72 hours. Irrigation should not begin within 12 hours of the end of rainfall so that direct storm runoff has ceased and soils are not saturated. Consequently, the length of the active irrigation period is 60 hours. The irrigation should include a cycling factor of ½, so that each portion of the area will be irrigated for only 30 hours during the total of 60 hours allowed for disposal of the water quality volume. Irrigation also should not occur during subsequent rainfall events.

- Irrigation System - Generally a spray irrigation system is required to provide an adequate flow rate for timely distribution of the water quality volume.
- Designs that utilize covered water storage should be accessible to vector control personnel via access doors to facilitate vector surveillance and control if needed.
- Irrigation Site Criteria – The area selected for irrigation must be pervious, on slopes of less than 10%. A geological assessment is required for proposed irrigation areas to assure that there is a minimum of 12 inches of soil cover. Rocky soils are acceptable for irrigation; however, the coarse material (diameter greater than 0.5 inches) should not account for more than 30% of the soil volume. Optimum sites for irrigation include recreational and greenbelt areas as well as landscaping in commercial developments. The stormwater irrigation area should be distinct and different from any areas used for wastewater effluent irrigation. Finally, the area designated for irrigation should have at least a 100-foot buffer from wells, septic systems, and natural wetlands.
- Irrigation Area – The irrigation rate must be low enough so that the irrigation does not produce any surface runoff; consequently, the irrigation rate may not exceed the permeability of the soil. The minimum required irrigation area should be calculated using the following formula:

$$A = \frac{12 \times V}{T \times r}$$

where:

A = area required for irrigation (ft2)

V = water quality volume (ft3)

T = period of active irrigation (30 hr)

r = Permeability (in/hr)

- The permeability of the soils in the area proposed for irrigation should be determined using a double ring infiltrometer (ASTM D 3385-94) or from county soil surveys prepared by the Natural Resource Conservation Service. If a range of permeabilities is reported, the average value should be used in the calculation. If no permeability data is available, a value of 0.1 inches/hour should be assumed.
- It should be noted that the minimum area requires intermittent irrigation over a period of 60 hours at low rates to use the entire water quality volume. This intensive irrigation may be harmful to vegetation that is not adapted to long periods of wet conditions. In practice, a much larger irrigation area will provide better use of the retained water and promote a healthy landscape.

Performance

This technology is still in its infancy and there are no published reports on its effectiveness, cost, or operational requirements.

Siting Criteria

Capture of stormwater can be accomplished in almost any kind of runoff storage facility, ranging from dry, concrete-lined ponds to those with vegetated basins and permanent pools. Siting is contingent upon the type of facility used.

Additional Design Guidelines

This technology is still in its infancy and there are no published reports on its effectiveness, cost, or operational requirements.

Maintenance

Relatively frequent inspection and maintenance is necessary to verify proper operation of these facilities. Some maintenance concerns are specific to the type or irrigation system practice used.

BMPs that store water can become a nuisance due to mosquito and other vector breeding. Preventing mosquito access to standing water sources in BMPs (particularly below-ground) is the best prevention plan, but can prove challenging due to multiple entrances and the need to maintain the hydraulic integrity of the system. Reliance on electrical pumps is prone to failure and in some designs (e.g., sumps, vaults) may not provide complete dewatering, both which increase the chances of water standing for over 72 hours and becoming a breeding place for vectors. BMPs that hold water for over 72 hours and/or rely on electrical or mechanical devices to dewater may require routine inspections and treatments by local mosquito and vector control agencies to suppress mosquito production. Open storage designs such as ponds and basins (see appropriate fact sheets) will require routine preventative maintenance plans and may also require routine inspections and treatments by local mosquito and vector control agencies.

Cost

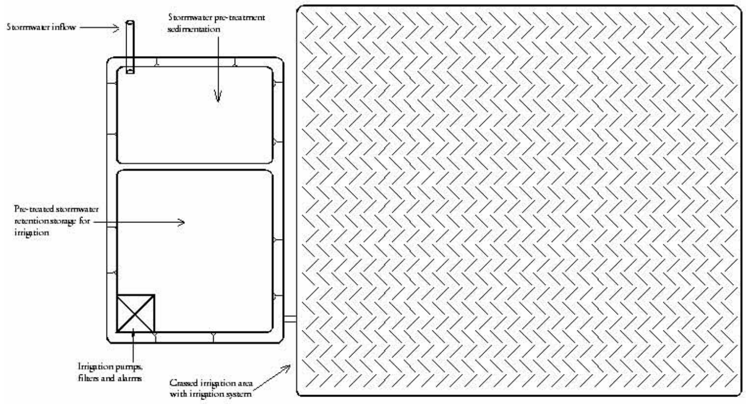
This technology is still in its infancy and there are no published reports on its effectiveness, cost, or operational requirements. However, O&M costs for retention-irrigation systems are high compared to virtually all other stormwater quality control practices because of the need for: (1) frequent inspections; (2) the reliance on mechanical equipment; and (3) power costs.

References and Sources of Additional Information

Barrett, M., 1999, Complying with the Edwards Aquifer Rules: Technical Guidance on Best Management Practices, Texas Natural Resource Conservation Commission Report RG-348. http://www.tnrcc.state.tx.us/admin/topdoc/rg/348/index.html

Lower-Colorado River Authority (LCRA), 1998, Nonpoint Source Pollution Control Technical Manual, Austin, TX.

Metzger, M. E., D. F. Messer, C. L. Beitia, C. M. Myers, and V. L. Kramer. 2002. The dark side of stormwater runoff management: disease vectors associated with structural BMPs. Stormwater 3(2): 24-39.



Stormwater inflow
Stormwater pre-treatment sedimentation
Pre-treated stormwater retention storage for irrigation
Irrigation pumps, filters and alarms
Grassed irrigation area with irrigation system

Design Considerations

- Accumulation of Metals
- Clogged Soil Outlet Structures
- Vegetation/Landscape Maintenance

Targeted Constituents

☑	Sediment	■
☑	Nutrients	■
☑	Trash	■
☑	Metals	■
☑	Bacteria	■
☑	Oil and Grease	■
☑	Organics	■

Legend ***(Removal Effectiveness)***

● Low ■ High

▲ Medium

Description

An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. Runoff is stored in the void space between the stones and infiltrates through the bottom and into the soil matrix. Infiltration trenches perform well for removal of fine sediment and associated pollutants. Pretreatment using buffer strips, swales, or detention basins is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective.

California Experience

Caltrans constructed two infiltration trenches at highway maintenance stations in Southern California. Of these, one failed to operate to the design standard because of average soil infiltration rates lower than that measured in the single infiltration test. This highlights the critical need for appropriate evaluation of the site. Once in operation, little maintenance was required at either site.

Advantages

- Provides 100% reduction in the load discharged to surface waters.
- An important benefit of infiltration trenches is the approximation of pre-development hydrology during which a significant portion of the average annual rainfall runoff is infiltrated rather than flushed directly to creeks.
- If the water quality volume is adequately sized, infiltration trenches can be useful for providing control of channel forming (erosion) and high frequency (generally less than the 2-year) flood events.

- As an underground BMP, trenches are unobtrusive and have little impact of site aesthetics.

Limitations

- Have a high failure rate if soil and subsurface conditions are not suitable.
- May not be appropriate for industrial sites or locations where spills may occur.
- The maximum contributing area to an individual infiltration practice should generally be less than 5 acres.
- Infiltration basins require a minimum soil infiltration rate of 0.5 inches/hour, not appropriate at sites with Hydrologic Soil Types C and D.
- If infiltration rates exceed 2.4 inches/hour, then the runoff should be fully treated prior to infiltration to protect groundwater quality.
- Not suitable on fill sites or steep slopes.
- Risk of groundwater contamination in very coarse soils.
- Upstream drainage area must be completely stabilized before construction.
- Difficult to restore functioning of infiltration trenches once clogged.

Design and Sizing Guidelines

- Provide pretreatment for infiltration trenches in order to reduce the sediment load. Pretreatment refers to design features that provide settling of large particles before runoff reaches a management practice, easing the long-term maintenance burden. Pretreatment is important for all structural stormwater management practices, but it is particularly important for infiltration practices. To ensure that pretreatment mechanisms are effective, designers should incorporate practices such as grassed swales, vegetated filter strips, detention, or a plunge pool in series.
- Specify locally available trench rock that is 1.5 to 2.5 inches in diameter.
- Determine the trench volume by assuming the WQV will fill the void space based on the computed porosity of the rock matrix (normally about 35%).
- Determine the bottom surface area needed to drain the trench within 72 hr by dividing the WQV by the infiltration rate.

$$d = \frac{WQV + RFV}{SA}$$

- Calculate trench depth using the following equation:

where:

D = Trench depth

WQV	=	Water quality volume
RFV	=	Rock fill volume
SA	=	Surface area of the trench bottom

- The use of vertical piping, either for distribution or infiltration enhancement shall not be allowed to avoid device classification as a Class V injection well per 40 CFR146.5(e)(4).
- Provide observation well to allow observation of drain time.
- May include a horizontal layer of filter fabric just below the surface of the trench to retain sediment and reduce the potential for clogging.

Construction/Inspection Considerations

Stabilize the entire area draining to the facility before construction begins. If impossible, place a diversion berm around the perimeter of the infiltration site to prevent sediment entrance during construction. Stabilize the entire contributing drainage area before allowing any runoff to enter once construction is complete.

Performance

Infiltration trenches eliminate the discharge of the water quality volume to surface receiving waters and consequently can be considered to have 100% removal of all pollutants within this volume. Transport of some of these constituents to groundwater is likely, although the attenuation in the soil and subsurface layers will be substantial for many constituents.

Infiltration trenches can be expected to remove up to 90 percent of sediments, metals, coliform bacteria and organic matter, and up to 60 percent of phosphorus and nitrogen in the infiltrated runoff (Schueler, 1992). Biochemical oxygen demand (BOD) removal is estimated to be between 70 to 80 percent. Lower removal rates for nitrate, chlorides and soluble metals should be expected, especially in sandy soils (Schueler, 1992). Pollutant removal efficiencies may be improved by using washed aggregate and adding organic matter and loam to the subsoil. The stone aggregate should be washed to remove dirt and fines before placement in the trench. The addition of organic material and loam to the trench subsoil may enhance metals removal through adsorption.

Siting Criteria

The use of infiltration trenches may be limited by a number of factors, including type of native soils, climate, and location of groundwater table. Site characteristics, such as excessive slope of the drainage area, fine-grained soil types, and proximate location of the water table and bedrock, may preclude the use of infiltration trenches. Generally, infiltration trenches are not suitable for areas with relatively impermeable soils containing clay and silt or in areas with fill.

As with any infiltration BMP, the potential for groundwater contamination must be carefully considered, especially if the groundwater is used for human consumption or agricultural purposes. The infiltration trench is not suitable for sites that use or store chemicals or hazardous materials unless hazardous and toxic materials are prevented from entering the trench. In these areas, other BMPs that do not allow interaction with the groundwater should be considered.

The potential for spills can be minimized by aggressive pollution prevention measures. Many municipalities and industries have developed comprehensive spill prevention control and countermeasure (SPCC) plans. These plans should be modified to include the infiltration trench and the contributing drainage area. For example, diversion structures can be used to prevent spills from entering the infiltration trench. Because of the potential to contaminate groundwater, extensive site investigation must be undertaken early in the site planning process to establish site suitability for the installation of an infiltration trench.

Longevity can be increased by careful geotechnical evaluation prior to construction and by designing and implementing an inspection and maintenance plan. Soil infiltration rates and the water table depth should be evaluated to ensure that conditions are satisfactory for proper operation of an infiltration trench. Pretreatment structures, such as a vegetated buffer strip or water quality inlet, can increase longevity by removing sediments, hydrocarbons, and other materials that may clog the trench. Regular maintenance, including the replacement of clogged aggregate, will also increase the effectiveness and life of the trench.

Evaluation of the viability of a particular site is the same as for infiltration basins and includes:

- Determine soil type (consider RCS soil type 'A, B or C' only) from mapping and consult USDA soil survey tables to review other parameters such as the amount of silt and clay, presence of a restrictive layer or seasonal high water table, and estimated permeability. The soil should not have more than 30 percent clay or more than 40 percent of clay and silt combined. Eliminate sites that are clearly unsuitable for infiltration.
- Groundwater separation should be at least 3 m from the basin invert to the measured ground water elevation. There is concern at the state and regional levels of the impact on groundwater quality from infiltrated runoff, especially when the separation between groundwater and the surface is small.
- Location away from buildings, slopes and highway pavement (greater than 6 m) and wells and bridge structures (greater than 30 m). Sites constructed of fill, having a base flow or with a slope greater than 15 percent should not be considered.
- Ensure that adequate head is available to operate flow splitter structures (to allow the basin to be offline) without ponding in the splitter structure or creating backwater upstream of the splitter.
- Base flow should not be present in the tributary watershed.

Secondary Screening Based on Site Geotechnical Investigation

- At least three in-hole conductivity tests shall be performed using USBR 7300-89 or Bouwer-Rice procedures (the latter if groundwater is encountered within the boring), two tests at different locations within the proposed basin and the third down gradient by no more than approximately 10 m. The tests shall measure permeability in the side slopes and the bed within a depth of 3 m of the invert.
- The minimum acceptable hydraulic conductivity as measured in any of the three required test holes is 13 mm/hr. If any test hole shows less than the minimum value, the site should be disqualified from further consideration.

- Exclude from consideration sites constructed in fill or partially in fill unless no silts or clays are present in the soil boring. Fill tends to be compacted, with clays in a dispersed rather than flocculated state, greatly reducing permeability.
- The geotechnical investigation should be such that a good understanding is gained as to how the stormwater runoff will move in the soil (horizontally or vertically) and if there are any geological conditions that could inhibit the movement of water.

Maintenance

Infiltration trenches required the least maintenance of any of the BMPs evaluated in the Caltrans study, with approximately 17 field hours spent on the operation and maintenance of each site. Inspection of the infiltration trench was the largest field activity, requiring approximately 8 hr/yr.

In addition to reduced water quality performance, clogged infiltration trenches with surface standing water can become a nuisance due to mosquito breeding. If the trench takes more than 72 hours to drain, then the rock fill should be removed and all dimensions of the trench should be increased by 2 inches to provide a fresh surface for infiltration.

Cost

Construction Cost

Infiltration trenches are somewhat expensive, when compared to other stormwater practices, in terms of cost per area treated. Typical construction costs, including contingency and design costs, are about \$5 per ft^3 of stormwater treated (SWRPC, 1991; Brown and Schueler, 1997). Actual construction costs may be much higher. The average construction cost of two infiltration trenches installed by Caltrans in southern California was about \$50/ft^3; however, these were constructed as retrofit installations.

Infiltration trenches typically consume about 2 to 3 percent of the site draining to them, which is relatively small. In addition, infiltration trenches can fit into thin, linear areas. Thus, they can generally fit into relatively unusable portions of a site.

Maintenance Cost

One cost concern associated with infiltration practices is the maintenance burden and longevity. If improperly sited or maintained, infiltration trenches have a high failure rate. In general, maintenance costs for infiltration trenches are estimated at between 5 percent and 20 percent of the construction cost. More realistic values are probably closer to the 20-percent range, to ensure long-term functionality of the practice.

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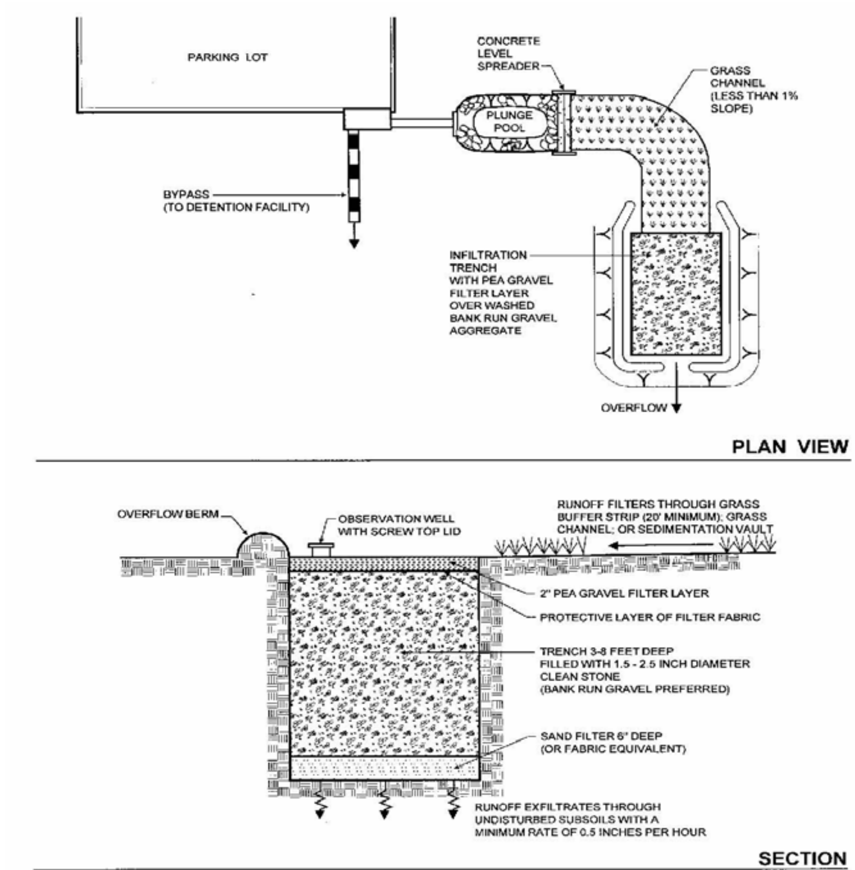
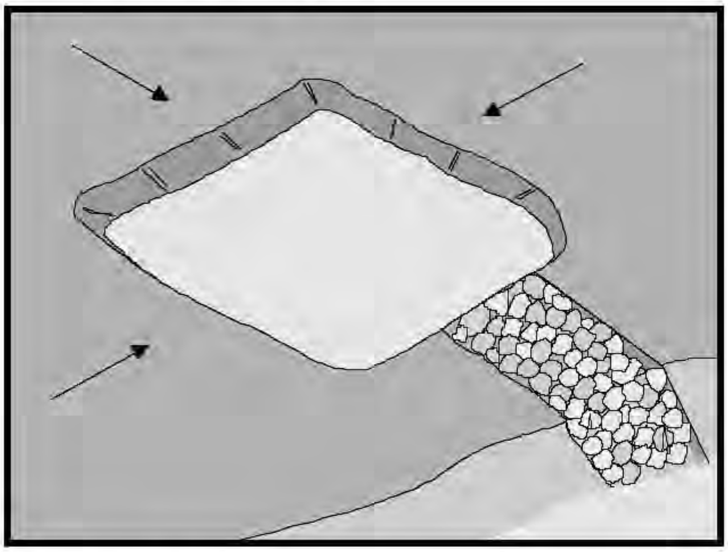

PARKING LOT
CONCRETE LEVEL SPREADER
GRASS CHANNEL (LESS THAN 1% SLOPE)
PLUNGE POOL
BYPASS (TO DETENTION FACILITY)
INFILTRATION TRENCH WITH PEA GRAVEL FILTER LAYER OVER WASHED BANK RUN GRAVEL AGGREGATE
OVERFLOW
PLAN VIEW
OVERFLOW BERM
OBSERVATION WELL WITH SCREW TOP LID
RUNOFF FILTERS THROUGH GRASS BUFFER STRIP (20' MINIMUM); GRASS CHANNEL; OR SEDIMENTATION VAULT
2" PEA GRAVEL FILTER LAYER
PROTECTIVE LAYER OF FILTER FABRIC
TRENCH 3-8 FEET DEEP FILLED WITH 1.5 - 2.5 INCH DIAMETER CLEAN STONE (BANK RUN GRAVEL PREFERRED)
SAND FILTER 6" DEEP (OR FABRIC EQUIVALENT)
RUNOFF EXFILTRATES THROUGH UNDISTURBED SUBSOILS WITH A MINIMUM RATE OF 0.5 INCHES PER HOUR
SECTION

Sediment Trap — SE-3



Description and Purpose
A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Suitable Applications
Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives
SE-2 Sediment Basin (for larger areas)

Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

Implementation

Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed of, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.
- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

Costs

Average annual cost per installation and maintenance (18 month useful life) is $0.73 per ft^3 ($1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 72 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.

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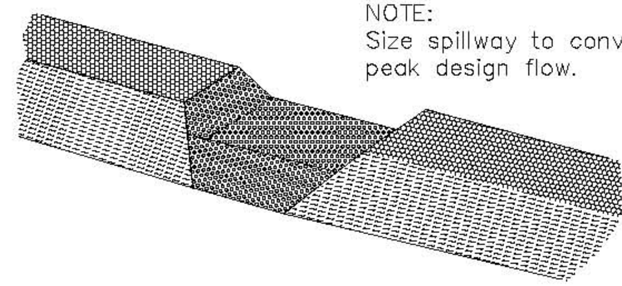
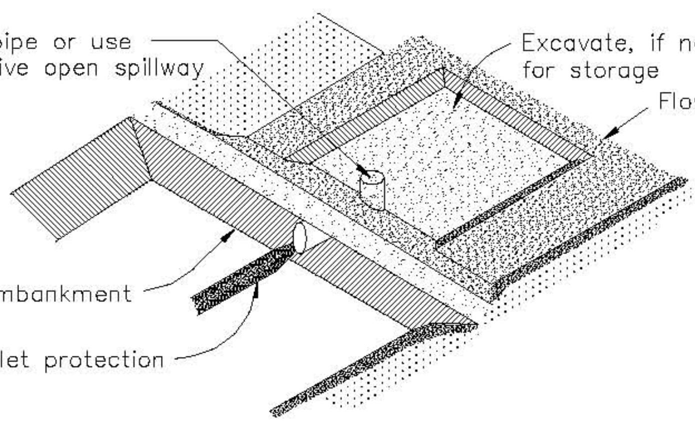
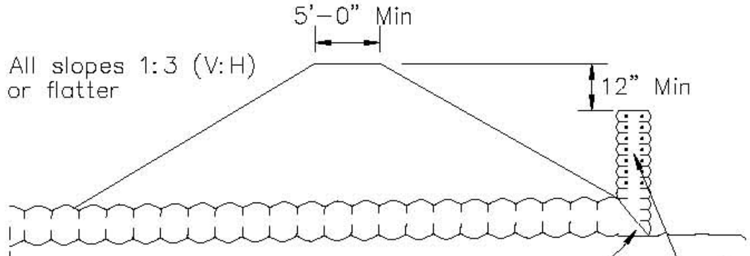


TYPICAL OPEN SPILLWAY





EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

Extended Detention Basin

Design Considerations

- Tributary Area
- Area Required
- Hydraulic Head

Description

Dry extended detention ponds (a.k.a. dry ponds, extended detention basins, detention ponds, extended detention ponds) are basins whose outlets have been designed to detain the stormwater runoff from a water quality design storm for some minimum time (e.g., 48 hours) to allow particles and associated pollutants to settle. Unlike wet ponds, these facilities do not have a large permanent pool. They can also be used to provide flood control by including additional flood detention storage.

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	■
☑	Metals	▲
☑	Bacteria	▲
☑	Oil and Grease	▲
☑	Organics	▲

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

California Experience

Caltrans constructed and monitored 5 extended detention basins in southern California with design drain times of 72 hours. Four of the basins were earthen, less costly and had substantially better load reduction because of infiltration that occurred, than the concrete basin. The Caltrans study reaffirmed the flexibility and performance of this conventional technology. The small headloss and few siting constraints suggest that these devices are one of the most applicable technologies for stormwater treatment.

Advantages

- Due to the simplicity of design, extended detention basins are relatively easy and inexpensive to construct and operate.
- Extended detention basins can provide substantial capture of sediment and the toxics fraction associated with particulates.
- Widespread application with sufficient capture volume can provide significant control of channel erosion and enlargement caused by changes to flow frequency

relationships resulting from the increase of impervious cover in a watershed.

Limitations

- Limitation of the diameter of the orifice may not allow use of extended detention in watersheds of less than 5 acres (would require an orifice with a diameter of less than 0.5 inches that would be prone to clogging).

- Dry extended detention ponds have only moderate pollutant removal when compared to some other structural stormwater practices, and they are relatively ineffective at removing soluble pollutants.

- Although wet ponds can increase property values, dry ponds can actually detract from the value of a home due to the adverse aesthetics of dry, bare areas and inlet and outlet structures.

Design and Sizing Guidelines

- Capture volume determined by local requirements or sized to treat 85% of the annual runoff volume.

- Outlet designed to discharge the capture volume over a period of hours.

- Length to width ratio of at least 1.5:1 where feasible.

- Basin depths optimally range from 2 to 5 feet.

- Include energy dissipation in the inlet design to reduce resuspension of accumulated sediment.

- A maintenance ramp and perimeter access should be included in the design to facilitate access to the basin for maintenance activities and for vector surveillance and control.

- Use a draw down time of 48 hours in most areas of California. Draw down times in excess of 48 hours may result in vector breeding, and should be used only after coordination with local vector control authorities. Draw down times of less than 48 hours should be limited to BMP drainage areas with coarse soils that readily settle and to watersheds where warming may be determined to downstream fisheries.

Construction/Inspection Considerations

- Inspect facility after first large to storm to determine whether the desired residence time has been achieved.

- When constructed with small tributary area, orifice sizing is critical and inspection should verify that flow through additional openings such as bolt holes does not occur.

Performance

One objective of stormwater management practices can be to reduce the flood hazard associated with large storm events by reducing the peak flow associated with these storms. Dry extended detention basins can easily be designed for flood control, and this is actually the primary purpose of most detention ponds.

Dry extended detention basins provide moderate pollutant removal, provided that the recommended design features are incorporated. Although they can be effective at removing some pollutants through settling, they are less effective at removing soluble pollutants because of the absence of a permanent pool. Several studies are available on the effectiveness of dry extended detention ponds including one recently concluded by Caltrans (2002).

The load reduction is greater than the concentration reduction because of the substantial infiltration that occurs. Although the infiltration of stormwater is clearly beneficial to surface receiving waters, there is the potential for groundwater contamination. Previous research on the effects of incidental infiltration on groundwater quality indicated that the risk of contamination is minimal.

There were substantial differences in the amount of infiltration that were observed in the earthen basins during the Caltrans study. On average, approximately 40 percent of the runoff entering the unlined basins infiltrated and was not discharged. The percentage ranged from a high of about 60 percent to a low of only about 8 percent for the different facilities. Climatic conditions and local water table elevation are likely the principal causes of this difference. The least infiltration occurred at a site located on the coast where humidity is higher and the basin invert is within a few meters of sea level. Conversely, the most infiltration occurred at a facility located well inland in Los Angeles County where the climate is much warmer and the humidity is less, resulting in lower soil moisture content in the basin floor at the beginning of storms.

Vegetated detention basins appear to have greater pollutant removal than concrete basins. In the Caltrans study, the concrete basin exported sediment and associated pollutants during a number of storms. Export was not as common in the earthen basins, where the vegetation appeared to help stabilize the retained sediment.

Siting Criteria

Dry extended detention ponds are among the most widely applicable stormwater management practices and are especially useful in retrofit situations where their low hydraulic head requirements allow them to be sited within the constraints of the existing storm drain system. In addition, many communities have detention basins designed for flood control. It is possible to modify these facilities to incorporate features that provide water quality treatment and/or channel protection. Although dry extended detention ponds can be applied rather broadly, designers need to ensure that they are feasible at the site in question. This section provides basic guidelines for siting dry extended detention ponds.

In general, dry extended detention ponds should be used on sites with a minimum area of 5 acres. With this size catchment area, the orifice size can be on the order of 0.5 inches. On smaller sites, it can be challenging to provide channel or water quality control because the orifice diameter at the outlet needed to control relatively small storms becomes very small and thus prone to clogging. In addition, it is generally more cost-effective to control larger drainage areas due to the economies of scale.

Extended detention basins can be used with almost all soils and geology, with minor design adjustments for regions of rapidly percolating soils such as sand. In these areas, extended detention ponds may need an impermeable liner to prevent ground water contamination.

The base of the extended detention facility should not intersect the water table. A permanently wet bottom may become a mosquito breeding ground. Research in Southwest Florida (Santana et al., 1994) demonstrated that intermittently flooded systems, such as dry extended detention ponds, produce more mosquitoes than other pond systems, particularly when the facilities remained wet for more than 3 days following heavy rainfall.

A study in Prince George's County, Maryland, found that stormwater management practices can increase stream temperatures (Galli, 1990). Overall, dry extended detention ponds increased temperature by about 5°F. In cold water streams, dry ponds should be designed to detain stormwater for a relatively short time (i.e., 24 hours) to minimize the amount of warming that occurs in the basin.

Additional Design Guidelines

In order to enhance the effectiveness of extended detention basins, the dimensions of the basin must be sized appropriately. Merely providing the required storage volume will not ensure maximum constituent removal. By effectively configuring the basin, the designer will create a long flow path, promote the establishment of low velocities, and avoid having stagnant areas of the basin. To promote settling and to attain an appealing environment, the design of the basin should consider the length to width ratio, cross-sectional areas, basin slopes and pond configuration, and aesthetics (Young et al., 1996).

Energy dissipation structures should be included for the basin inlet to prevent resuspension of accumulated sediment. The use of stilling basins for this purpose should be avoided because the standing water provides a breeding area for mosquitoes.

Extended detention facilities should be sized to completely capture the water quality volume. A micropool is often recommended for inclusion in the design and one is shown in the schematic diagram. These small permanent pools greatly increase the potential for mosquito breeding and complicate maintenance activities; consequently, they are not recommended for use in California.

A large aspect ratio may improve the performance of detention basins; consequently, the outlets should be placed to maximize the flowpath through the facility. The ratio of flowpath length to width from the inlet to the outlet should be at least 1.5:1 (L:W) where feasible. Basin depths optimally range from 2 to 5 feet.

The facility's drawdown time should be regulated by an orifice or weir. In general, the outflow structure should have a trash rack or other acceptable means of preventing clogging at the entrance to the outflow pipes. The outlet design implemented by Caltrans in the facilities constructed in San Diego County used an outlet riser with orifices

Figure 1
Example of Extended Detention Outlet Structure

sized to discharge the water quality volume, and the riser overflow height was set to the design storm elevation. A stainless steel screen was placed around the outlet riser to ensure that the orifices would not become clogged with debris. Sites either used a separate riser or broad crested weir for overflow of runoff for the 25 and greater year storms. A picture of a typical outlet is presented in Figure 1.

The outflow structure should be sized to allow for complete drawdown of the water quality volume in 72 hours. No more than 50% of the water quality volume should drain from the facility within the first 24 hours. The outflow structure can be fitted with a valve so that discharge from the basin can be halted in case of an accidental spill in the watershed.

Summary of Design Recommendations

(1) Facility Sizing - The required water quality volume is determined by local regulations or the basin should be sized to capture and treat 85% of the annual runoff volume. See Section 5.5.1 of the handbook for a discussion of volume-based design.

Basin Configuration – A high aspect ratio may improve the performance of detention basins; consequently, the outlets should be placed to maximize the flowpath through the facility. The ratio of flowpath length to width from the inlet to the outlet should be at least 1.5:1 (L:W). The flowpath length is defined as the distance from the inlet to the outlet as measured at the surface. The width is defined as the mean width of the basin. Basin depths optimally range from 2 to 5 feet. The basin may include a sediment forebay to provide the opportunity for larger particles to settle out.

A micropool should not be incorporated in the design because of vector concerns. For online facilities, the principal and emergency spillways must be sized to provide 1.0 foot of freeboard during the 25-year event and to safely pass the flow from 100-year storm.

(2) Pond Side Slopes - Side slopes of the pond should be 3:1 (H:V) or flatter for grass stabilized slopes. Slopes steeper than 3:1 (H:V) must be stabilized with an appropriate slope stabilization practice.

(3) Basin Lining – Basins must be constructed to prevent possible contamination of groundwater below the facility.

(4) Basin Inlet – Energy dissipation is required at the basin inlet to reduce resuspension of accumulated sediment and to reduce the tendency for short-circuiting.

(5) Outflow Structure - The facility's drawdown time should be regulated by a gate valve or orifice plate. In general, the outflow structure should have a trash rack or other acceptable means of preventing clogging at the entrance to the outflow pipes.

The outflow structure should be sized to allow for complete drawdown of the water quality volume in 72 hours. No more than 50% of the water quality volume should drain from the facility within the first 24 hours. The outflow structure should be fitted with a valve so that discharge from the basin can be halted in case of an accidental spill in the watershed. This same valve also can be used to regulate the rate of discharge from the basin.

The discharge through a control orifice is calculated from:

$$Q = CA(2g(H-H_o))^{0.5}$$

where:
Q = discharge (ft^3/s)
C = orifice coefficient
A = area of the orifice (ft^2)
g = gravitational constant (32.2)
H = water surface elevation (ft)
H_o= orifice elevation (ft)

Recommended values for C are 0.66 for thin materials and 0.80 when the material is thicker than the orifice diameter. This equation can be implemented in spreadsheet form with the pond stage/volume relationship to calculate drain time. To do this, use the initial height of the water above the orifice for the water quality volume. Calculate the discharge and assume that it remains constant for approximately 10 minutes. Based on that discharge, estimate the total discharge during that interval and the new elevation based on the stage volume relationship. Continue to iterate until H is approximately equal to H_o. When using multiple orifices the discharge from each is summed.

(6) Splitter Box - When the pond is designed as an offline facility, a splitter structure is used to isolate the water quality volume. The splitter box, or other flow diverting approach, should be designed to convey the 25-year storm event while providing at least 1.0 foot of freeboard along pond side slopes.

(7) Erosion Protection at the Outfall - For online facilities, special consideration should be given to the facility's outfall location. Flared pipe end sections that discharge at or near the stream invert are preferred. The channel immediately below the pond outfall should be modified to conform to natural dimensions, and lined with large stone riprap placed over filter cloth. Energy dissipation may be required to reduce flow velocities from the primary spillway to non-erosive velocities.

(8) Safety Considerations - Safety is provided either by fencing of the facility or by managing the contours of the pond to eliminate dropoffs and other hazards. Earthen side slopes should not exceed 3:1 (H:V) and should terminate on a flat safety bench area. Landscaping can be used to impede access to the facility. The primary spillway opening must not permit access by small children. Outfall pipes above 48 inches in diameter should be fenced.

Maintenance

Routine maintenance activity is often thought to consist mostly of sediment and trash and debris removal; however, these activities often constitute only a small fraction of the maintenance hours. During a recent study by Caltrans, 72 hours of maintenance was performed annually, but only a little over 7 hours was spent on sediment and trash removal. The largest recurring activity was vegetation management, routine mowing. The largest absolute number of hours was associated with vector control because of mosquito breeding that occurred in the stilling basins (example of standing water to be avoided) installed as energy dissipaters. In most cases, basic housekeeping practices such as removal of debris accumulations and vegetation management to ensure that the basin dewaters completely in 48-72 hours is sufficient to prevent creating mosquito and other vector habitats.

Consequently, maintenance costs should be estimated based primarily on the mowing frequency and the time required. Mowing should be done at least annually to avoid establishment of woody vegetation, but may need to be performed much more frequently if aesthetics are an important consideration.

Typical activities and frequencies include:

- Schedule semiannual inspection for the beginning and end of the wet season for standing water, slope stability, sediment accumulation, trash and debris, and presence of burrows.
- Remove accumulated trash and debris in the basin and around the riser pipe during the semiannual inspections. The frequency of this activity may be altered to meet specific site conditions.
- Trim vegetation at the beginning and end of the wet season and inspect monthly to prevent establishment of woody vegetation and for aesthetic and vector reasons.
- Remove accumulated sediment and re-grade about every 10 years or when the accumulated sediment volume exceeds 10 percent of the basin volume. Inspect the basin each year for accumulated sediment volume.

Cost

Construction Cost

The construction costs associated with extended detention basins vary considerably. One recent study evaluated the cost of all pond systems (Brown and Schueler, 1997). Adjusting for inflation, the cost of dry extended detention ponds can be estimated with the equation:

$$C = 12.4V^{0.760}$$

where: C = Construction, design, and permitting cost, and
V = Volume (ft^3).

Using this equation, typical construction costs are:

$ 41,600 for a 1 acre-foot pond

$ 239,000 for a 10 acre-foot pond

$ 1,380,000 for a 100 acre-foot pond

Interestingly, these costs are generally slightly higher than the predicted cost of wet ponds (according to Brown and Schueler, 1997) on a cost per total volume basis, which highlights the difficulty of developing reasonably accurate construction estimates. In addition, a typical facility constructed by Caltrans cost about $160,000 with a capture volume of only 0.3 ac-ft.

An economic concern associated with dry ponds is that they might detract slightly from the value of adjacent properties. One study found that dry ponds can actually detract from the perceived value of homes adjacent to a dry pond by between 3 and 10 percent (Emmerling-Dinovo, 1995).

Maintenance Cost

For ponds, the annual cost of routine maintenance is typically estimated at about 3 to 5 percent of the construction cost (EPA website). Alternatively, a community can estimate the cost of the maintenance activities outlined in the maintenance section. Table 1 presents the maintenance costs estimated by Caltrans based on their experience with five basins located in southern California. Again, it should be emphasized that the vast majority of hours are related to vegetation management (mowing).

Table 1 Estimated Average Annual Maintenance Effort

Activity	Labor Hours	Equipment & Material ($)	Cost
Inspections	4	7	183
Maintenance	49	126	2282
Vector Control	0	0	0
Administration	3	0	132
Materials	-	535	535
Total	**56**	**$668**	**$3,132**

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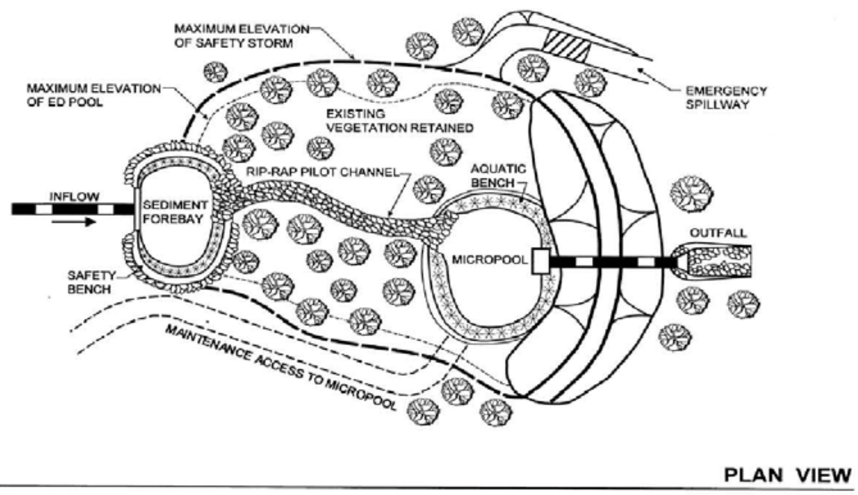

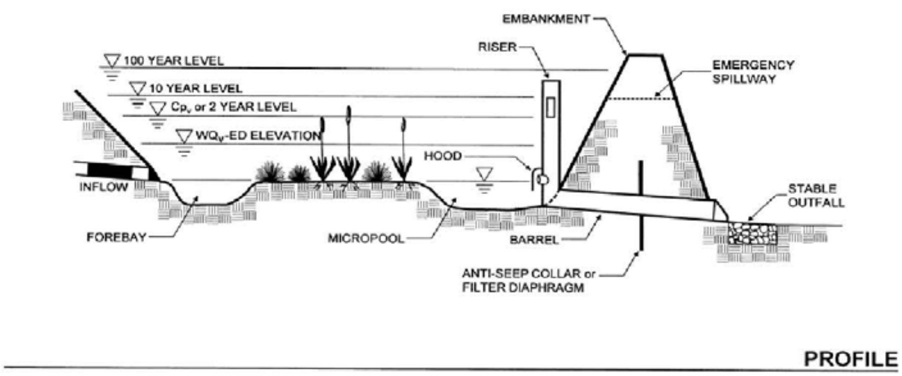

Schematic of an Extended Detention Basin (MDE, 2000)

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March 22, 2012
P/W 1102-01
Report No. 1102-01-B-11

Attention: Mr. Jon Rilling

Subject: Preliminary Infiltration Rates, Lilac Hills Ranch, Valley Center Community Planning Area, County of San Diego, California

Reference: *Feasibility Level Geotechnical Report, Las Lilas Project, Valley Center Area, San Diego, California, prepared by Pacific Soils Engineering, Inc. dated May 23, 2007 (PSE W.O. 401120)*

Gentlemen:

Pursuant to a request from representatives of Landmark Consulting, transmitted herein is Advanced Geotechnical Solutions, Inc.'s (AGS) estimated infiltration rates for use in the preliminary design of infiltration basins for the Lilac Hills Ranch project, Valley Center Community Planning Area, County of San Diego, California. Site specific testing has not been conducted onsite for the determination of infiltration rates. The rates presented herein are based upon USDA Natural Resource Conservation Service (NCRS) mapping, information provided by the County of San Diego, Department of Public Works, and the characteristics of the onsite soils and bedrock.

We have provided you preliminary mapping of the site showing the approximate location of the various geologic units onsite. Based upon the geologic units the following estimated infiltration rates are presented:

- **Artificial Fill, Compacted** (no map symbol)- Soil Group D (rates 0 to 0.05 inches per hour)
- **Artificial Fill, Undocumented** (map symbol afu)- Soil Group D (rates 0 to 0.05 inches per hour)
- **Alluvium** (map symbol Qal)- Soil Group C (rates 0.05 to 0.15 inches per hour)
- **Older Alluvium** (map symbol Qoal)- Soil Group C (rates 0.05 to 0.15 inches per hour)
- **Granitic Rock** (map symbol Kgr)- Soil Group D (rates 0 to 0.05 inches per hour)

The aforementioned rates are highly dependent upon the depth to the underlying relatively impermeable granitic rock and whether the area has been subjected to loading from grading or farming equipment as this will tend to densify the soils and reduce the infiltration rates. Infiltration basins should be located such that the infiltration water is located down gradient from all structural building pads.

Should you desire more accurate design rates than these general rates presented herein, additional testing can be conducted. This testing should be conducted utilizing a Double Ring Infiltrometer apparatus.

Rates determined with the Double Ring Infiltrometer are considered to be more accurate by the local Water Quality Control Board than other methods.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to contact the undersigned.

Respectfully Submitted,
Advanced Geotechnical Solutions, Inc.

JEFFREY A. CHANEY, Vice President
RCE 46544/ GE 2314

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